The Chemical Age

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Welding Methods in Chemical Plant

IT has been claimed that welding has advantages over riveting for chemical plant construction because larger units are possible economically with consequent greater output, greater pressures are possible in that vessels working up to 600 lbs. pressure can be at least as economically manufactured welded as riveted, the interior of the vessels can be made smooth and without cavities in which possibly dangerous liquids may be trapped, causing serious accidents during cleaning or contamination of products, and finally the exact shape of vessels required can be produced more readily. As against these advantages it can be said for riveting that the weaknesses due to weld decay or other uncertainties that affect welded construction are absent and that welding is still more dependent upon the personal equation Welding, of course, as pointed out in these columns on August 12, is a scientific art that is yet in its infancy and depends upon advances in metallurgy for its own advances. It seems at the moment as though welding is likely to be the principal method of construction of chemical plant in the future, though whether that is due to the enthusiastic advocacy of welding practitioners, or whether it will in truth oust other methods of construction is an issue that must be judged by events.

Gas welding, electric-resistance butt welding and metallic arc fusion welding are the three principal methods used in the construction of chemical plant. There is some evidence that gas welding, by which is usually meant oxy-acetylene or oxy-hydrogen welding, is inferior to electric welding for certain purposes because gas welds may corrode because of contamination of the weld by constituents of the flames resulting from the chemical actions taking place. Electric resistance butt welding has the advantage, of course, that only the metal itself is used so that outside impurities are not introduced, but this does not prevent metallurgical changes within the metal which may be as deleterious as the impurity. Probably metallic arc fusion welding is used more than any other method for manufacturing chemical plant in iron and steel, this method consisting of depositing weld metal from an electrode identical in composition with the parent metal or of very similar composition.

An interesting difficulty with welded vessels is the construction of plant to contain corrosive substances when the conditions are such that the original metal is only susceptible of attack under limiting conditions. The storage of concentrated sulphuric acid in steel tanks is an instance; it may well be that immunity from corrosion is due to the structure of the steel or to the absence of quite small impurities. The welding operation may introduce these impurities or may alter the metallurgical structure of the steel and thus cause corrosion at the welds. Obviously welding methods, such as the metallic arc fusion process, must be used which will tend to keep these adverse influences down to the minimum. The corrosion difficulties are accentuated by the possibility of electrolytic action due to differences in the composition of the metal. This particular difficulty is accentuated when more heterogeneous metals such as the nickel-chromium alloys are used for plant construction and generally it is desirable to normalise the steel after welding by suitable heat treatment. Excessive corrosion has been known to occur in stainless steel, for example, over the area immediately adjacent to the joints owing to the precipitation and deposition on the grain boundaries of carbide when the steel is heated to 500 to 900 deg. C. This leads to a concentration of chromium carbide at one point and therefore to an adjacent low-chromium area, the steel then becoming readily attacked at the crystal junctions and embrittled. The difficulty can be largely overcome by annealing the welded plant at 1,000 to 1,050 deg. C. Grain growth and brittleness which occur with certain acid-resisting steels, such as those containing 16 to 18 per cent. of chromium and no nickel, on heating above 1,000 deg. C. may be prevented by addition of a metal such as tantalum, titanium or columbium that readily forms a carbide, thus absorbing the liberated carbon.

Non-ferrous metals, such as copper, aluminium, nickel and many alloys can be welded by the same methods as for steel, but using electrodes of similar composition to the parent metal, the comparatively new atomic hydrogen system being often used advantageously for most of these non-ferrous metals. In this method alternating current is passed between tungsten electrodes while a current of hydrogen is passed round the arc thus formed. The high temperature thus generated decomposes the molecular hydrogen into atomic hydrogen which on cooling just beyond the boundaries of the arc recombines into molecular hydrogen with the generation of sufficient heat to effect the weld. The advantage of this process is that a flame free from oxygen can be employed and no oxides are produced as impurities in the weld. The introduction of technique of this character emphasises the fact that welding is still evidently susceptible of advances as yet undreamed of.

Undoubtedly welding is widely applicable to the manufacture of chemical plant, but it may be wisdom to deprecate too-zealous advocacy of welding methods in these early days. Usually, chemical engineering firms can work equally well in welded or in riveted construction so that it is a matter of indifference to them which is used. This fact should make for steady rather than spectacular progress.

NOTES AND COMMENTS

Gas for Motor Transport

PETROL restrictions have prompted many gas undertakings to embark on schemes for the supply of coal-gas fuel to motorists as an alternative to petrol. Birmingham Gas Department has been conducting intensive research work into the practicability of running internal combustion and oil engines on gas during the past ten years. This has resulted in a high pressure scheme being developed which is perfectly sound, but which unfortunately requires a good deal of plant and apparatus to enable it to be used on a large scale. The extent to which it can be used in this way, therefore, is dependent entirely on obtaining apparatus and plant which includes expensive compressors, special steel cylinders and other apparatus. This in turn will, of course, depend upon what priority the Government are prepared to give manufacturers of such appliances, so that they may obtain the necessary raw materials to produce the goods. Close communication with the Government Departments concerning this matter is being maintained by the Birmingham Gas Department and it is hoped shortly to hear that the necessary support will be forthcoming. A garage at Bradford has begun making gas bags for attachment to vehicles driven by coal gas, while at Leeds, Bradford, Keighley, Chesterfield and many other places, gasfilling stations are being established by gasworks.

The Melchett Lecture

AT a meeting of the Council of the Institute of Fuel held last week it was decided to cancel the annual dinner and dance arranged for Thursday, October 19. As a partial substitute for the annual dinner and in honour of Mr. H. A. Humphrey, the Melchett Medallist, a luncheon is to be held at the Connaught Rooms on the same date at 12.45 p.m., when copies of the Melchett Lecture will be distributed. Mr. Humphrey will give a summary of his address together with some additional information, and the Melchett Medal will be presented to him. The title of Mr. Humphrey's lecture is "The Supply of Explosives during the last war and the early history of Billingham," and we hope at the appropriate time to be in a position to reproduce extracts in THE CHEMICAL AGE. The ordinary meetings of the Institute for the presentation and discussion of papers are to be suspended for the time being, as such meetings could only be held during the day time when members are occupied with more important duties and could not attend.

British Stocks of Radium

ONE of the minor difficulties of wartime organisation is the prevention of damage due to allowing dangerous substances to get out of control. The destruction of poisonous snakes in Zoological Gardens is an instance of the methods that have been used in one direction. Radium is intensely dangerous when not under control and its effects do not readily disappear, since radium has a period of average life of 2,440 years. Novelists have found in the conception of an all-destroying "ray" an excellent motif for horrific fiction duly impressing the unscientific. Perhaps the emanations of the radio-active family are as near to "death rays" as we are likely to get in this direction in practice, and their effect is confined to a comparatively short range. Nevertheless, the escape of quantities of radium might well be attended with quite serious local consequences to those who are in, or may later come within, the vicinity. For this reason it has been found necessary severely to restrict the use of radium in the present emergency. Most of the nations stock has been buried at the foot of a 50 ft. borehole, drilled specially for use in wartime at one of the hospitals. The radium and its containers are in a steel cylinder, which before being lowered was loaded at the well-head by an operator protected by standing behind a thick block of lead. Our immensely valuable store of this element is thus protected against absolute loss, and in addition the damage that might be caused if it were scattered by an explosion is obviated. For the present, deep X-ray therapy is being used for medical purposes instead of radium wherever possible.

America Takes the Cash

THE alteration of the Neutrality Laws of the United States on the grounds put forward by the President is a foregone conclusion. The policy of America for the moment is to maintain her neutrality and take the cash but, in the light of the experience of the last war, that attitude is liable at any time to undergo alteration. From the trade point of view, there are two things to be said about the new arrangements. America under the Neutrality Act was free to send us aluminium, called by the President *alloominum*, and other raw materials, but she was not free to send these materials, again to quote the President, "in processed form." She can now send the aluminium in the form of aeroplane wings, and so with other materials. The first point is that we shall take all the raw material we can and process it ourselves so far as we can, only paying American wages for manufacturing in so far as we have not sufficient facilities ourselves. The next point, and one of far more importance, is that when we have to import war materials or anything else, we should strive wherever possible to buy them in markets which are open to Germany.

Accidents from Explosives in 1938

ACCORDING to the sixty-third annual report of H.M. Inspectors' of Explosives the number of accidents in manufacture during 1938 was about the same as for the previous year, but it is to be regretted that the number of casualties was higher. The increase was due to a serious accident in a mixing house which resulted in a number of deaths and injuries to workpeople. Commenting on the use of explosives in coal mines, the report states that ten explosives have passed the tests at Buxton. Five of these were added to the Permitted List and in other cases definitions in the Permitted List were amended to cover some modification. Eight explosives were allowed to be sheathed with approved materials. There were seven gas ignitions during the year, of which six were with Permitted and one with non-permitted explosives. Considerable increase in the use of sheathed explosives has again taken place and, in view of the findings of the Royal Commission on Safety in Coal Mines, whose report was published during the year, this is a satisfactory feature. In view of the recent stirring of interest in the gas traction question, the comment of the report on this point is most topical. The emergency of September, 1938, it is stated brought this question into prominence once again. Owners of lorries, etc., anticipating the inevitable restriction in petrol supplies, began to think again of possible substitutes, of which compressed town gas is one. "It is hoped that the revived interest in this, one of several home-produced substitutes for petroleum, will not be allowed to die," states the report.

The First War Budget

Sternest in British Financial History

THE first war budget is the sternest in British financial history. Income Tax at 7s. 6d. in the £ which with surtax means a levy of 17s. in the £ on the highest scale, is a sacrifice never before demanded in this or any other civilised country. It is a burden that will be borne unflinchingly by the direct taxpayer as the increased duties on sugar, tobacco and alcohol will be borne by the indirect taxpayer, as a contribution willingly made in the sacred cause. Both sections of the tax-paying community, however, will pay this price only on condition that the money is wisely and economically spent in the one over-riding task of defeating the enemy. Sir John Simon, in his budget speech, showed his appreciation of the need of stopping extravagance in the Departments of State, old and new. Sir John Marriott and Sir Charles Harris, old campaigners on the anti-waste front, are already in the field and they will receive the whole-hearted backing of the business community. When the nation is asked in 1939 to pay by way of increased taxation more than the entire expenditure in 1913-14, there can be nothing but the most ruthless application of an axe such as Sir Eric Geddes used upon the swollen post-war departments.

Maintaining Export Trade

Institute of Export's Representations

AFTER hearing representations from members in Scotland, the North, the Midlands and the South of England, the Institute of Export has sent the following resolution to Sir Patrick Hannon, M.P., its president:—

The Government has already emphasised, in general terms, the vital necessity of maintaining our export trade. The importance of this is obvious (currency for imports of war material, etc.).

Unless very urgent action is taken we are in danger of losing our vital connections in overseas countries. The main difficulties in order of magnitude are:—

Raw Material Supplies: At the present time there is a system of priorities beginning with raw materials required to fill orders from Government Defence Departments, followed by various other categories in descending order of precedence, but without any mention of or regard to export. It is suggested that raw material to fill orders for export should be given priority ranking only second to Government Defence Departments.

Export Licences: The present staff working on the Department concerned with this are doing their utmost, but delay in procedure (and due to inadequate staff) is resulting in lost business. It is suggested that speeding-up and relaxation of obstacles is vital.

Prices: Owing to the constant soaring of raw material costs it is almost impossible to quote firm prices to customers abroad (particularly since no-one can be sure when, if, and at what price the requisite raw materials will be available. Government intervention by control, quota or subsidy (to ensure and stabilise raw material costs and supplies for filling export orders) is indicated.

Export personnel engaged in export trade should be given every encouragement and assistance.

It must be noted that German exports are at the moment pouring into the Swiss, Scandinavian, Dutch and Belgian markets, while many British firms are at a standstill as far as their exports are concerned. They cannot even despatch orders ready for shipment, let alone execute orders on hand or quote firm prices with promise of definite delivery. In fact they do not know where they are and are inclined to write off both their existing export connection and all prospect of being able to compete in overseas markets. It is suggested the whole problem needs the most urgent and decisive action by the Government Departments concerned.

Money Payments to Enemies

Enemy (Custodian) Order

WITH the object of preventing the payment of money to enemies and preserving enemy property in contemplation of arrangements to be made at the conclusion of peace, the Board of Trade have, in pursuance of powers conferred on them by Section 7 of the Trading with the Enemy Act, made the Enemy (Custodian) Order which is now in force.

The order requires any money normally payable to or for the benefit of an enemy to be paid within 14 days to the Custodian of enemy property for that part of the United Kingdom in which the person who makes the payment is resident or carries on business. The terms "enemy" "enemy subject" and "enemy property" are defined in the Trading with the Enemy Act, but it should be noted that "enemy" does not include an enemy subject resident in this country.

This requirement relates in particular to dividends, bonuses or interest, capital sums arising from the redemption or maturity of securities, profits in any business or enterprise, debts (including bank balances), assurance moneys, rents of all kinds, payments for requisitioned property, payments arising under any trust or settlement. Any money which would be payable to any purported assignee, transferee or allottee must be paid to the Custodian and no person must without consent of the Board of Trade part with or otherwise deal with the property of any enemy. The Order further gives power to the Board of Trade to make Orders vesting in the Custodian such enemy property as they may prescribe.

Any person holding or managing property for or on behalf of an enemy or enemy subject is required within 14 days to give notice of the fact to the Custodian and to furnish the Custodian with such returns, accounts, and other information, and produce for inspection such documents in relation thereto as the Custodian may require. Companies incorporated in the United Kingdom and companies incorporated outside the United Kingdom which have a share transfer or share registration office in this country are required to furnish in writing to the Custodian within a similar period full particulars of all securities issued by the company which are held by or for the benefit of an enemy. Every partner and every firm of which any of the partners is an enemy or to which money has been lent by an enemy is similarly required to disclose to the Custodian full particulars of any share of profits or any interest due to such an enemy.

The order further provides for the retention by the Custodian of fees equal to 2 per cent. of (a) the amount of moneys paid to him; and (b) the value of any property vested in him.

Letters to the Editor

Britain's Export Trade

Sir,—In the last three years a gigantic effort in organisation has taken place; the forces of industry have been mobilised for the production of modern armaments and, at the same time, the vital needs of Britain's export trade have been safeguarded.

Britain, as we know, is prepared for a three years' war. This preparation involves not only the steady working out of the defence programme and the production of munitions, but the no less important claims of the nation's civil needs and of our markets overseas.

The F.B.I., in its side, will do everything in its power to ensure that Britain's export trade receives the fullest possible consideration, subject to the requirements of the fighting services, and, in particular, I would point out that machinery has been set up by the Federation to ensure that export inquiries received by firms unable at the moment to carry them out can be passed on to firms able to do so.—Yours faithfully,

GUY LOCOCK.

Federation of British Industries,
21 Tothill Street,
London, S.W. 1. September 19.

Safety in the Chemical Industry

By

M. B. DONALD, M.Sc., M.I.Chem.E., F.I.C.

Mr. M. B. Donald

THE chemical industry in this country is particularly fortunate in having very keen and enthusiastic safety workers. In fact one might almost draw the paradox that the more hazardous the industry the safer it becomes. This is, of course, partly due to the psychological fact that the more aware we are of danger the more safety precautions we instinctively undertake.

The safety worker is also fortunate in the sources from which he can get information to help him. The Government, through the Home Office, have an extensive museum in Horseferry Road, London, S.W.1. This museum covers all aspects of safety and in the case of any specific inquiry the staff are always very willing to give advice. The exhibits are continually being changed to bring the museum up-to-date and two or three hours spent wandering round is well worth the time. Some of the London colleges make a practice of sending their students round the museum at some time during their training to ensure that the ideas of safety precaution are instilled in them before they enter industry. The National Safety First Association has an industrial section to which firms may subscribe and which in return supplies them with information and literature. Most of the excellent safety posters one sees in industrial works are provided by this organisation.

The needs of the chemical industry are more specifically met by the Quarterly Safety Summary of the Association of British Chemical Manufacturers. Typical cases extracted from a recent number refer to safety methods of storing ether, explosive properties of magnesium perchlorate and a fatal case of poisoning by hydrogen sulphide. The Medical Research Council also actively co-operate on questions of poisoning. It recently issued a book by Dr. Ethel Browning on the "Toxicity of Organic Solvents" and it is prepared to carry out tests on the toxicity of any new industrial gases or vapours.

The professional organisations help by producing discussions and conferences on this subject. Early this year the Chemical Engineering Group of the Society of Chemical Industry had a two day conference on all phases of the subject in collaboration with the National Safety First Association. Similarly the Institution of Chemical Engineers had a paper last year by Dr. Donald Hunter, M.D., F.R.C.P., on the "Prevention of Disease in Industry." The Institute of Chemistry are now issuing a pamphlet at suitable intervals entitled "Laboratory Precautions."

Essential Education

The chief essential of any safety measure is the proper education as to the hazards and means of preventing them from being fatal. One source of information which has not yet been fully exploited, although steps are being taken to try and remedy this defect, are the text-books of inorganic and organic chemistry used by students in learning their subjects. These often omit any reference whatever to the physiological or other dangerous effects caused by chemicals. In fact sometimes such information as is vouchsafed is distinctly misleading. Apart from the purely voluntary work on safety there are Government regulations. The legal aspects of safety, health and welfare of workers in factories were discussed in an excellent paper by J. Davidson Pratt and G. S. W. Marlow, entitled "Legal Pitfalls for the Chemical Engineer." This paper has now been reprinted and is obtainable from the Institution of Chemical Engineers.

It is obviously impossible to touch on anything but the fringe of the subject in a short article, but it is hoped that by enumerating the sources of information those who are interested can get further information for themselves. It is interesting to consider various hazards and precautions which were discussed at the last conference held by the Chemical Engineering Group.

An interesting fact brought out by S. H. Wilkes and Dr. D. Matheson, H.M. Engineering Inspectors of Factories, was that carbon monoxide produces as many accidents as all the other gases put together. The blast furnace, with its associated equipment, produces more gassing accidents than any other individual plant. The total reported cases of gassing in the last six years varied from 100 to 200 and the number of deaths from 10 to 20 per annum.

They also stated that probably no other single item of chemical plant had caused so many gassings and explosions as defective or inadequately closed valves. In many cases the only safe remedy is not to trust any valve, but to blank off the pipe when there is any danger of gassing or an explosion. One alternative is to lock the valve shut and to give the key to the man who would be injured if it were opened.

New Type of Gassing Accident

The development of welding has led to a new type of gassing accident in recent years. If the welding is carried out in an enclosed space, appreciable quantities of nitrous fumes are evolved due to the combination of atmospheric oxygen and nitrogen at high temperatures. These fumes are decidedly more poisonous than is usually suspected. In two cases men who had been affected by them during welding died the same night. This type of accident is known as a "surprise" gassing and is due mostly to the fact that there is a lack of knowledge on the part of operators of the particular hazard that may be present. It is for these cases that the wider dissemination of knowledge is extremely helpful. Other "suprise" gassings have been due to alkaline washings containing sulphides meeting waste acids in an open drain, phosgene from carbon tetrachloride used to put out electrical fires; sometimes they are due to the lack of oxygen in holes in marshy ground or in closed linseed oil tanks.

The detection of toxic gases is a very important aspect of safety precautions. As a result of discussions between the Association of British Chemical Manufacturers and the Home Office, work was undertaken by the Chemical Research Department of the Department of Scientific and Industrial Research and the standard tests for industrial use are now being issued as pamphlets by H.M. Stationery Office. A summary of these tests has been given by Dr. R. B. Vallender.

For the detection of carbon monoxide two tests are now available. Iodine pentoxide and fuming sulphuric acid give a transient blue colour or a stain can be produced on palladium chloride paper. The presence of phosgene—even in concentrations as low as one part in a million can be detected by means of diphenylamine-p-dimethylamino-benzaldehyde test paper. One peculiarity about hydrogen sulphide is that

it cannot be smelt in concentrations over 0.01 per cent. since it paralyses the olfactory nerve.

With regard to organic solvents it has been pointed out by Wing Commander T. McClurkin that the chief offenders are carbon bisulphide, benzols, etc., and chlorinated hydrocarbons. Of the last group, tetrachlorethane is the most dangerous and it has now been eliminated wherever possible by the substitution of other solvents. Benzene gives rise to severe anæmia associated with changes in the blood forming elements of the bone marrow. Both the red and white cells in the blood are reduced in number. Tetrachlorethane gives rise to gastric trouble and jaundice and after death there has been found to be marked atrophy of the liver. The investigations of the toxic effects of certain chlorinated hydrocarbons is now being carried out under the direction of the Toxicity of Industrial Solvents Committee of the Medical Research Council.

Segregating Poisoning Cases

It is usual to segregate cases into "acute" poisoning which results from a short exposure to a high vapour concentration and into "chronic" poisoning which results from repeated exposure to low concentrations. An interesting observation is that the poisoning effect of methyl alcohol is ascribed to the subsequent formation of formic acid and formaldehyde in the body. Similarly diethylene dioxide "Dioxan" is said to form oxalic acid.

The problem of dusts, especially that of silicosis, is still unsolved, but a great advance was made when Dr. Jones approached the subject from the petrological viewpoint and examined silicotic lung tissue under a geological microscope with crossed nicols. He changed the whole course of research by showing that the active constituent was not silica but a silicate.

Dust, however, is not only dangerous from this aspect since many dusts admixed with air are explosive. Great havoc has been wrought in grain elevators and coal mines from dust explosions. An experimental coal dust explosion engine has been running for many years and for those who are still sceptics there is a very interesting experimental demonstration available at the Home Office Museum. The late Professor W. E. Gibbs, who had made a study of the subject, collected all the information in a book "The Dust Hazard in Industry" published in 1925 in Benn's Chemical Engineering Library.

Fire Hazards

The annual value of property destroyed by fire every year has been stated by Mr. J. R. Howcroft to be ten million pounds sterling. Up to fifty years ago only water was available for fire fighting. Carbon tetrachloride is now used for dealing with highly inflammable materials and electrical fires owing to its insulating properties. The volume of vapour produced is about 230 times that of the liquid and it is over four times as heavy as air.

Carbon dioxide in cylinders is a very clean method of stopping fires especially in laboratories where they can be put out with the minimum of disturbance. Another method of applying carbon dioxide is in the foam produced by mixing solutions of sodium bicarbonate and aluminium sulphate in the nozzle together with a foam producer such as liquorice. There is a tendency nowaways to use an air foam instead of a carbon dioxide foam and this is produced by mixing air, water and foam producing compound in the jet.

Mr. Howcroft has pointed out that additional precautions are necessary in war time. It is inadvisable to rely on water from the main since they may be quite probably put out of action. A number of old tanks fixed in the ground at suitable points in the works will form local reservoirs which will provide sufficient water for the fires to be put out before they attain unmanageable proportions.

The whole essence of the training of an engineer is to consider safety first. Almost every calculation includes a factor of safety but even then accidents occur. A fruitful cause of accidents is due to the practice of tightening up bolts with a spanner having a length of gas piping put on one end to give a better leverage. The result more often than not is that the bolt is permanently strained and the leak is only partially prevented. It is nearly always quicker and much more satisfactory to take the surfaces down and to clean them very carefully before re-assembling. It is surprising how the smallest particles prevent a joint from being made tight.

The advent of welding has brought its own problems. These are chiefly concerned with the skill of the welder and the reproducibility of his work. At the present moment it is often impossible to check the workmanship and this is particularly true, as has been emphasised by Mr. A. H. Goodger, in the case in which the weld has been made from one side only due to questions of inaccessibility preventing the worker approaching the job from both sides. He has also pointed out that these one-sided welds not only have structural defects, but are also very much more prone to corrosion if small cracks are left in the metal.

A frequent cause of mechanical accidents is due to unguarded shafting. It is very easy to ensure that belting is guarded by means of wire netting, but it is surprising to see the lack of attention this most important precaution receives.

Due to the enormous amount of work that has been devoted to the design of gas masks for war purposes and for industrial purposes by firms such as Siebe, Gorman and Co. there are a very large number of respirators now available. These vary from the simple dust respirator to the more complicated types for use in mines with individual oxygen cylinders. The selection of the most suitable type for a works requires careful consideration.

Protective Clothing

Much time and thought has been devoted to the question of protective clothing by Mr. R. E. Tugman of the I.C.I. For the protection of eyes there are different goggles according to whether they are for use against dust, small stones, irritant gas, splashes of corrosive liquid or molten metal, or from harmful heat rays when welding. Rubber gloves should not be worn so that the top part of the gauntlet acts as a funnel to catch splashes of liquid.

In conclusion, it is necessary to touch on the psychological aspects of safety. A large proportion of accidents are due to some of the following causes, which have been listed by Mr. R. J. Woods, the safety officer at Billingham. They are:—Domestic worries, fear, unsuitability for a particular job, fatigue, ill-health, inability to face ridicule, abnormal temperature, etc. An experienced psychologist can often learn very much more about an accident by a quiet personal talk than the more formal method of holding an inquiry. Often a number of accidents can be traced to over-zealousness on the part of the employee, resulting in foolish risks being taken to endeavour to keep the plant running. It should be possible to take care of this by talks and posters to educate the men.

EXAMINATION OF OIL STORAGE TANKS

H.M. Chief Inspector of Factories has exempted from the requirements of Sub-section (4) of Section 31 of the Factories Act, 1937, as to the cleaning and examination of its internal surfaces any oil storage tank forming part of a multiple-head oil fountain, subject to the following conditions:—(1) the tank, or the compressed air inlet pipe to the tank, shall be fitted with a suitable safety valve so adjusted as to permit the air to escape as soon as the safe working pressure is exceeded; (2) the tank shall be tested to twice the safe working pressure at least once in every period of 26 months by oil pressure or by hydraulic pressure; such test pressure shall be maintained for at least 20 minutes. The tank shall be examined externally by a competent person while the test pressure is so maintained, and the competent person shall make such gaugings of the deflection of the tank as he may consider necessary; (3) a report of the result of every test and examination made in accordance with condition (2) above shall be made upon the prescribed form of report of examination of air receiver (Form 59); (4) this exemption shall not apply to any tank having a maximum working pressure greater than 25 lb. per sq. in.

NEW PLANT ACCESSORIES

In this and succeeding pages new plant accessories, the majority of them introduced during the past twelve months, are described and illustrated. The range is extensive and varied, comprising as it does the products of Ashworth and Parker, Ltd., C. L. Burdick Manufacturing Co., the Audley Engineering Co., Ltd., the Lea Recorder Co., Ltd., Short and Mason, Ltd., the Saunders Valve Co., Ltd., George Kent, Ltd., the Valor Co., Ltd., the Automatic Coil Winder and Electrical Equipment Co., Ltd., and Dawson, McDonald and Dawson.

A Unique Generating Set—First Installation of its Type

A HIGH-SPEED, back-pressure steam engine, direct coupled to an alternator running in parallel with the grid, the load developed by the set being determined by the demand for process steam in the works at any particular moment, was recently supplied to the Golden Valley Ochre and Oxide Co. (Yate), Ltd., by Ashworth and Parker, Ltd. It is believed to be the first installation of its type in this country.

It is a well-known fact that power can very economically be produced from process steam by first passing this through a back-pressure steam engine before utilising the steam in the works. Where all the steam so exhausted can be absorbed this is perhaps the cheapest possible method of developing power, but there are many cases where a satisfactory balance cannot be struck between the amount of steam required for process work and the quantity required to develop power and if the latter is at any time in excess of the works steam requirements this blows to waste with a resultant loss in economy. The adoption of a pass-out engine often affords a solution of the problem as this type of engine only passes out steam for process work as and when required, but in such cases a compound or triple-expansion engine is always necessary and generally condensing plant as well.

In this instance, as no water was available for condensing, arrangements were made for the consumer's new power plant to run in parallel with the grid and a two-crank, back-pressure engine and alternator installed. To meet the variations in the process steam demand a control gear was designed and fitted, which avoids the engine exhausting more steam than can be absorbed in the works. This special regulating gear, self-contained with the engine and requiring no outside supply of pressure water or oil for its operation, controls the steam admitted to the engine and consequently the load and the amount of steam exhausted to the process mains. The regulation is decided solely by the pressure in the process steam main. A slight drop in the pressure in the main due to an increased demand for process steam will instantly operate the regulator and admit more steam to the engine and vice versa. The operation is entirely automatic and whilst the load is being constantly varied to meet the fluctuation in the process steam requirements the speed of the engine is maintained perfectly steady and in synchronisation with the grid. There is no sign of hunting and the pressure in the process main is kept within very close limits.

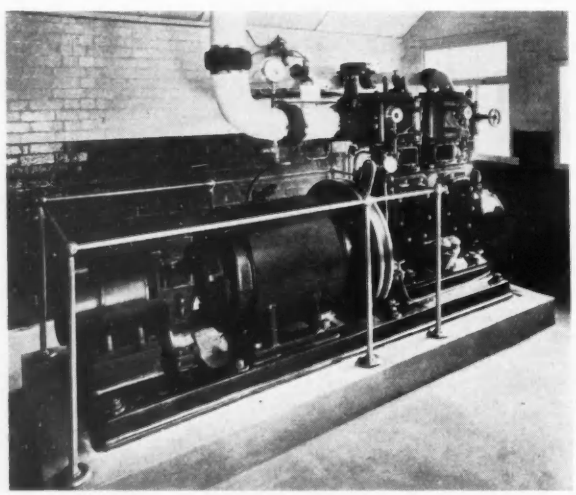
When the engine is developing less power than the works requirements the balance is, of course, made up by the grid supply. No difficulties arise in respect to synchronising.

Manufacture of Saunders' Valves

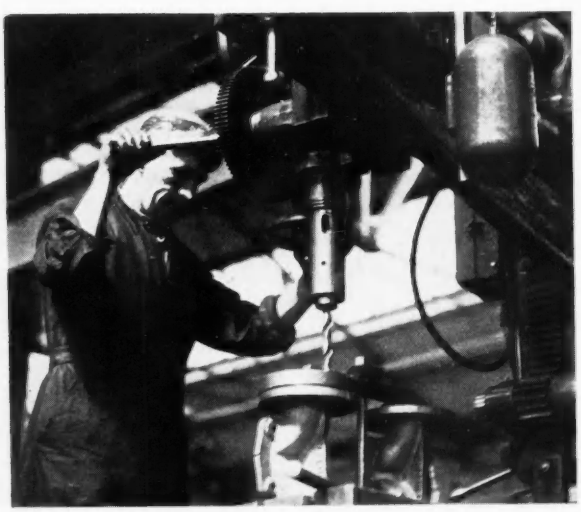
LAST March the new factory of the Cwmbran Engineering Co., Ltd., a subsidiary of the Saunders Valve Co. Ltd., was opened at Cwmbran, Mon., for the production of Saunders' valves.

The basic principle underlying the design and operation of Saunders' valves is that the flow is arrested within the body by means of a highly resilient and durable synthetic rubber closure member in place of the more complicated and generally accepted practice of employing metal-to-metal seating members. Conversely, to permit of flow, the resilient closure member or diaphragm is withdrawn until it conforms to the normal surface of the pipeline, thus forming a streamline passage. In this way the usual troublesome gland is eliminated, no leakage can occur, the operating mechanism of the valve is completely isolated from the fluid, ease of operation is obtained owing to undisturbed lubrication, and sensitive liquids such as emulsions or foodstuffs are not contaminated. The inconvenience of "seizing" and "jamming" cannot occur, and maintenance costs are reduced to the occasional replacement of the rubber diaphragm. These replacements can be effected without removing the valve or disturbing the pipeline.

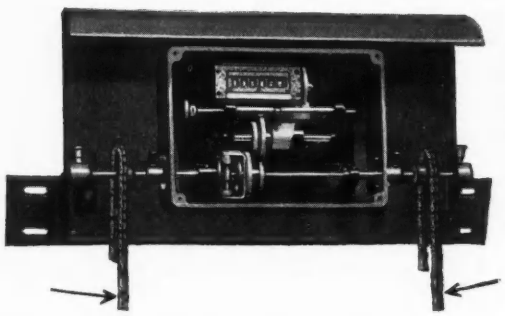
In the machine shop of the new factory every operation is done to jigs, and most of the machine tools are of a special nature. Special mention may be made of two machines upon which both sides of the valve body are faced, drilled and



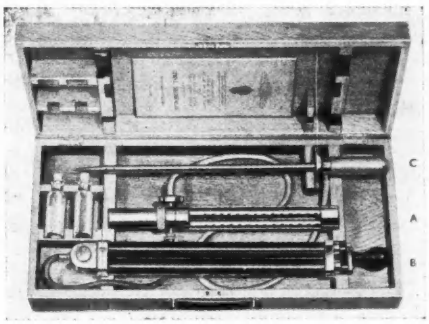
The 26 kW generating set running in parallel with the grid supplied by Ashworth & Parker, Ltd., to the Golden Valley Ochre & Oxide Co. (Yate), Ltd.



Operating a radial drilling machine in the manufacture of Saunders' valves.



Left: A Lancashire type coal meter with "Uni-Meter" Mechanism, made by the Lea Recorder Co., Ltd.



Right: The CLB hygroscope, manufactured by the C. L. Burdick Manufacturing Co.

tapped at one operation. A special drilling machine, which simultaneously drills four holes in the bonnet, drills and faces the central hole for the bush which carries the spindle. Other equipment includes a special horizontal milling machine, radial drills, capstan lathes, etc. In the construction of the diaphragm which constitutes the chief working part of the Saunders valve, full advantage is taken of the latest developments in synthetic rubber technique. The equipment of the rubber shop consists of a battery of steam-heated hydraulic presses, mixing mill, a callender, steam-heated tables, autoclaves, liner tables, a punching machine for punching the bolt holes in the finished diaphragm, stock cooling tanks, and other necessary equipment for handling plantation and synthetic rubber. Neoprene is used for the manufacture of the diaphragm, as it is superior to natural rubber compounds in its resistance to the action of oils and fats—vegetable and mineral—and to many chemicals. It is also more resistant to heat, while it ages better in storage and sunlight, does not propagate flame, and resists the action of ozone and oxygen.

Compounding is the first process in the manufacture of the sheet from which diaphragms and valve body linings are made up. This is carried out in the mill which, as in most rubber plants, consists of two rollers geared together side by side. A characteristic compound consists of Neoprene, light calcined magnesia, wood resin and zinc oxide.

Reference has been made to lining the bodies of Saunders' valves with natural rubber and Neoprene. The cast iron valve body, slightly enlarged as to the bore to allow for the thickness of the rubber lining, is prepared by coating the whole of the inner surface with a rubber solution. The object of closing the inner surfaces with a bonding material is to ensure the lining adhering to the metal with such tenacity that when the whole process of lining is complete it is practically impossible to separate the runner from the metal. The long life of the Saunders valve lining is largely dependent on this feature.

Water Percentage Determination

IN the processing of many materials it is desirable to know precisely the right moisture content for successful operations and in buying and selling a knowledge of how much water is changing hands is necessary.

The C.L.B. hygroscope, an entirely new instrument for determining the percentage of water in substances, made by the C. L. Burdick Manufacturing Co., Stevenage House, 40-44 Holborn Viaduct, London, E.C.1, is designed to meet the call for more exact and efficient methods.

This invention, which is only being marketed after many months of experimental work, is based on the principle that the humidity of the air in the interstices of a substance is a correct indication of the percentage of water present. It is well known that air which is in close contact with a hygroscopic substance such as grain, tobacco, tea and textile materials, will, in a short time, come to equilibrium with the quantity of water contained in the substance. So that, by measuring the relative humidity of this air, the percentage of water to substance can be determined with great accuracy.

In the C.L.B. hygroscope, the wet and dry bulb method of determining the relative humidity of the air in the interstices has been adopted. This method gives both accuracy and speed; the time required for a test is less than three minutes. The apparatus, which, as shown in the accompanying illustration, is supplied in a strong oak wood case, together with psychrometric tables, consists of three units. Firstly, there are two specially designed wet and dry bulb thermometers, mounted in a casing, with a container for a supply of water and an air filter; secondly, a double-acting suction hand pump; and, lastly, an insertion piece which is introduced into the substance to be tested. The operation of the pump, taking from 60 to 90 seconds, secures a constant flow of the air from the substance over the two bulbs. The sectional area of the pump is in such a ratio to the sectional area of the space around the wet bulb as to secure a continuous flow of from eight to ten feet per second. An automatic release valve insures that excessive vacuum is never obtained. Filters are provided to prevent dust collecting on the muslin of the wet bulb. The differential between the readings of the bulbs is taken and, by reference to the tables supplied, the correct relative humidity is ascertained at once.

Trial tests with quantities of each class of substance will show the variations in relative humidity; from this it is possible to determine the variations of water present in each case. Tabulated lists can then be prepared and, when subsequent readings are taken, they will give the percentage of water to a high degree of accuracy.

Simplified Meter Registration

BY the addition of a patent "Uni-Meter" mechanism the Lea Recorder Co., Ltd., have considerably simplified the registration of their coal meters for Lancashire boilers.

All such meters, which are based on the volumetric principle, have to be calibrated or tested *in situ* whether for chain grates, ram-type stokers, cubi-meters or Romer meters, in order to determine the value of the unit, either in cubic feet or lb. weight.

This work has still to be done, and cannot be avoided, but by means of the "Uni-Meter" mechanism the fractional units, whether in cubic feet or pounds, are automatically converted into integral numbers instead of fractions, e.g., suppose that, by calibration or testing, the value of the unit works out at 1.245 cubic feet. By adjusting the "Uni-Meter" mechanism by means of a knurled screw the unit can be altered to 1.00 cubic feet. The work of multiplying by an awkward fraction is thus avoided.

Again:—Suppose that in the above case the coal weighs 47 lb. per cubic feet, and the volume unit = 1.245 cubic feet as before. 1.245×47 lb. = 58.515 lb. By adjusting the "Uni-Meter" mechanism the unit can be altered to 60 lb., which is much more convenient for multiplying purposes.

New Time Schedule Controller

AN interesting development in the range of industrial and scientific instruments manufactured by Short and Mason, Ltd., Aneroid Works, E.17, is a new version of the well-known time schedule controller, so called because it controls

temperature, pressure, rate of flow or liquid level, etc., to a given schedule, continuously repeating this as required.

The controller operates in conjunction with the usual diaphragm valves, and similar devices, and is housed in two cases which contain the same mechanism and the controlling and recording portion. The curvatures of the same dictate the temperature and pressure cycle through the recording and controlling mechanism. Compressed air is the actuating medium.

An additional feature of considerable interest is a quick rise mechanism which enables almost any rate of rise to be achieved. The incorporation of the universal sensitivity adjuster enables the instrument sensitivity to be matched with the time lag of the apparatus, ensuring close, "throttling" control.

A complete range of 6 in. Dial Thermometers, mercury and vapour actuated, in brass chromium plated cases, are also new manufactures. The mechanism is similar to that fitted in the popular 8 in. size, with sturdy movement, bold pointer and easy reading graduations. A heat treated alloy-steel movement can be supplied where there is excessive vibration. A comprehensive list of ranges and fittings are available, also "Accuratus" temperature compensated capillary tubing, for use where the capillary runs through fluctuating temperature zones, to prevent these fluctuations being transmitted to the indicating pointer.

Low Resistance Ohmmeter

THE "Avo" low resistance ohmmeter, made by the Automatic Coil Winder and Electrical Equipment Co., Ltd., is a compact, self-contained instrument, designed specifically for the measurement of low resistance over a scale 2½ in. in length.

It has two ranges: 0-20 and 0-500 ohms, the scale shape being such that on the lower range, 1/10th of an ohm corresponds to a deflection of nearly ⅛-in. and two ohms to a mid-scale position. The scale shape is the same for each range, thus making 20 ohms the mid position on the higher range. The meter is provided with two press-buttons, the range being selected by pressure of the appropriate one. Adjustment is provided for the state of the 1½-volt cell fixed in the instrument, this cell being easily replaced when necessary.

The Universal "Avometer" is a new addition to the company's range of "Avo" electrical measuring instruments and takes the place of the well-known 36 range meter. Its main differences and modifications include increased number of ranges, the protective cut-out instead of the fuse, three ohms ranges with internal batteries and a fourth using either A.C. or D.C. mains. The instrument consists of a moulded panel, on the inside of which are mounted the whole of the switching apparatus, resistances, shunts, transformer, rectifier, etc., and the moving coil. The entire switching of the resistances, shunts, transformer, etc., is accomplished automatically by means of two switch knobs on the panel, each being plainly marked so that the range in use appears opposite an arrowhead. As no external apparatus is needed, only two terminals are required to connect the instruments for any test, leads fitted with spring clips being provided for the purpose.

Another new instrument which has been introduced by the company during the past twelve months is the "Avo" test bridge which is suitable for a direct measurement of all sizes of condensers and resistances normally encountered in radio and electrical engineering.

Protection Against Fire

SAFETY first is a slogan which appeals to the British public, be they business men or busy housewives, and as a guard against the risks of fire its application is always necessary.

The Valor Co., Ltd., are the manufacturers of a range of fire extinguishers suitable for varying purposes. The "Valor-Fydrant" chemical extinguisher (plunger soda-acid type) is suitable for ordinary fire risks. The "Valor-Foamera" extinguisher (foam type) is suitable for installation where there is a danger of fire from petrol, oil, benzole, etc. It is tested to a pressure of 350 lb. per square inch and throws a snow-like substance of a tenacious character a distance of over 30 feet. The material used in the making of the extinguisher is of specially prepared sheet steel, the inner container being made of tinned copper with lead stopple.

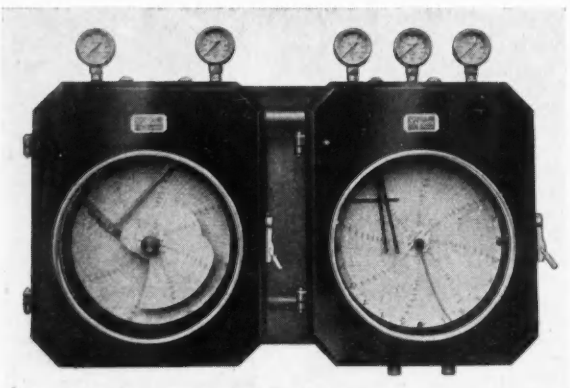
A new portable water boiler, manufactured by the company, is suitable for A.R.P. work. It has a capacity of ten gallons, a copper boiler (tinned inside), copper hinged lid, copper condenser and galvanised casing. Cupboards and office furniture made of fire-resisting steel are other interesting manufactures of the company.

Compton Spray Guns

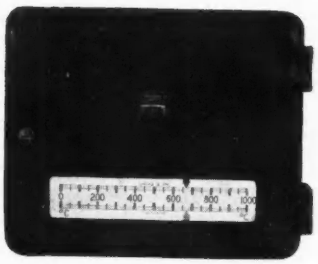
A NEW design of jet arrangement which ensures robust construction, easy adjustment and ready accessibility of all parts for cleaning or dismantling is a feature of the Compton spray guns manufactured by Dawson, McDonald and Dawson, Compton Engineering Works, Ashbourne, Derbyshire.

The jet arrangement (types D.P.1 and D.G.1) is based on an entirely new principle, and is self-centring (air-jet to liquid-jet). It is free of complicated and troublesome liquid and air passages and drill-ways, dribble-proof, and yet

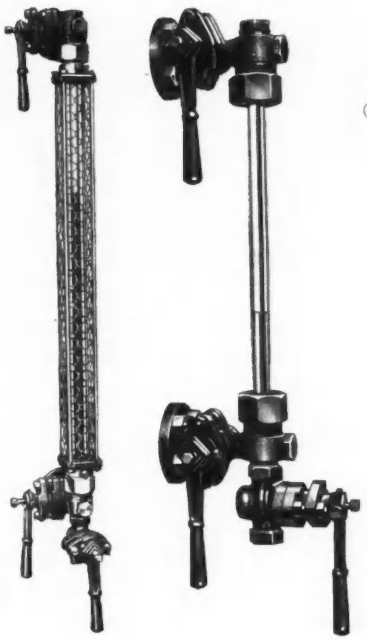
The "Avo" low resistance ohmmeter made by the Automatic Coil Winder & Electrical Equipment Co., Ltd.



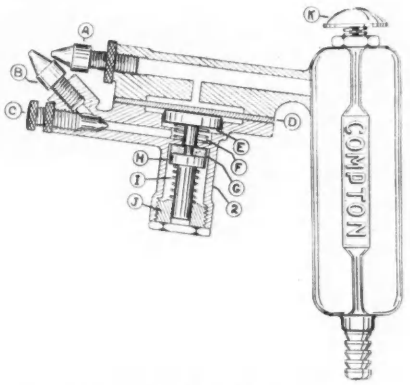
A new version of the well-known time schedule controller made by Short & Mason, Ltd.



An indicating instrument, specially designed for furnace control manufactured by George Kent, Ltd.



"Audco" level gauge fittings, manufactured by the Audley Engineering Co., Ltd. Left: with protection glass; right: without protection glass.



A sectional diagram of a Compton spray gun, made by Dawson, McDonald & Dawson. A—Air Jet; B—Fluid jet; C—Fluid control screw; D—Diaphragm; E—valve operating pad; F—diaphragm return spring; G—detachable valve seating; H—valve single (liquid); I—valve spring (liquid); J—valve tail bearing and plug; K—air valve.

capable of producing a first-class, free, well-atomised and delicate spray.

The liquid-valve is automatic, and is associated with the air supply in such a manner that it is impossible for the valve to open unless air pressure is present in the gun.

An additional advantage is that in operation, as soon as the air valve is closed a back-suction effect is created in the liquid jet, drawing liquid back into the gun, and preventing any possibility of dribble. The valves are very strongly and simply made and work for long periods without attention. If, however, after prolonged use it becomes necessary to replace the detachable valve disc, this can be easily accomplished in a matter of minutes only.

Type C.I. and C.I.H. also possess a new design of jet arrangement. Type C.I.H. incorporates a hermetic sealing arrangement which is quite unique in that it enables the gun to be hermetically sealed when not in use, and allows the gun to be in intermittent use without the necessity for cleaning after each operation.

A New Indicating Instrument

THE latest edition to the Multelec range of potentiometric temperature controllers manufactured by George Kent, Ltd., is in the form of an indicating instrument, specially designed for furnace control.

It is built on the same principles and with similar mechanism to the Mark II recording temperature controller, and is fitted with a control point setting knob on the front of the case, and a bold indicating scale. Multi-point switches are available so that the instrument can connect with various points at will. The case has a serviceable finish in matt black, and is designed for wall or flush panel mounting.

The features of the Recording Multelec for Temperature, including automatic cold-junction temperature compensation, indifferences to high or varying line resistance, and potentiometric principle making accuracy independent of changing Galvanometer characteristics, apply also to the indicating instrument.

Another instrument introduced during the past twelve months is the Kent specific gravity recorder controller. This instrument uses a standard differential pressure recorder connected to a patented arrangement of comparator tubes. The measuring device consists principally of two vertical tubes, one containing the standard liquid and the other containing the liquid of which the varying specific gravity is to be recorded. The differential pressure resulting from these two columns of equal height but unequal density is transmitted usually by air reaction to the U tube of a standard differential meter. A continuous record of the S.G. is thus obtained on a daily or weekly 12 in. diameter chart. Owing to the patented principle of using the difference between two columns the chart commences to register at one or some other convenient figure instead of at zero, thus giving greatly increased accuracy.

The great advantage of the comparator system as contrasted with the usual system of employing a single column is that the recorder comes to zero not when the back pressure equals zero as in the case of the single column but when the differential equals zero, i.e., when the specific gravity of the test liquid reaches 1.0.

Level Gauge Fittings

"AUDCO" level gauge fittings manufactured by the Audley Engineering Co., consist Ltd., primarily of "Audco" patented lubricated valves in which all working surfaces are always covered by a film of lubricant.

The units are flanged at one end for quick, rigid attachment to the vessel and shaped at the other end to form the actual glass support. In addition a drain valve is screwed on the bottom fitting. The provision of a check valve on the lower unit prevents undue loss of fluid in the event of a fractured glass, yet does not impede the flow of fluid under working conditions.

The company's patented austenitic alloy "Audcoloy" has, during the past 12 months, been used more and more extensively in various chemical industries. It is particularly resistant to sulphuric acid, caustic soda, mixed acids, fatty acids, corrosive crude oils, etc. In addition to nickel, copper and small quantities of other essential metals, "Audcoloy" contains a sufficient percentage of silicon to impart to it increased resistance to erosion, but without making the alloy brittle, unmachinable or unsuitable for use at high temperatures.

OPERATING CONDITIONS IN CHEMICAL PROCESSES

Some Aspects of Their Measurement and Control

By

C. H. BUTCHER

THE operation of chemical plant at its highest efficiency can be regarded very much as a matter of keeping the process within certain limits of temperature, pressure, rate of flow and such other conditions as are likely to vary. Just how far it is possible to dispense with the measurement and control of these variable conditions depends much upon the type of plant and the nature of the process. Safety in operation, some definite standard of quality for the product, elimination of waste, data for costing purposes, and precise knowledge for repeating conditions are all concerned. Mere indications of temperature and pressure are necessities from the aspect of safety; precise measurement of variables, with the making of permanent records, give the means whereby conditions may be correlated with results obtained and any particular result repeated as often as necessary. These remarks, of course, apply on the assumption that the plant incorporates good chemical engineering design from point of view of relative capacities for different vessels, pipes, valves and other plant features, as well as constructional details considered generally.

High Degree of Refinement

A very large number of instruments are now obtainable to measure process variables, and the high degree of refinement which has been reached is evident from the inspection of any modern boiler plant. Some of these instruments merely measure and indicate; others make a permanent record in chart form, or go still further by incorporating the necessary means to give automatic control. In the charts the plant user has valuable practical data for repeating operating conditions or for varying them with the assurance of closely obtaining some other desired result, as well as data for computing certain items in process costs. Detailed study will reveal plant operating faults, or at least usefully indicate the source of known or suspected troubles so that they may be reduced in their effect upon the course of the process.

Summed up in two words this use of instruments for the control of plant, irrespective of whether the actual control is done manually or automatically, becomes a matter of "detecting differences." First, differences in those variables which can affect the course of the process have to be detected; then, and only then, the necessary corrections can be made. That is essentially the solution of all problems of process control, and in practice it is fortunate to find that the arbitrary control of comparatively few variables will cover the entire course of the process. In most cases temperature, pressure, rate of flow and composition are concerned, closely followed by a check on hydrogen ion concentration.

Detection of Pressure Differences

The detection of pressure differences is comparatively simple. The use of a manometer, for instance, will indicate the pressure of a medium—gas or liquid—under observation by difference in the height of mercury or other fluid in the limbs of the familiar manometer U-tube. Even such a simple device as this can be adapted for control purposes automatically by the use of a float with mechanical accessories to convert the pressure differences into mechanical movements of corresponding proportions. Then there are pressure elements of the Bourdon tube, helix, bellows or diaphragm types, which convert pressure difference into mechanical movement without the intermediate use of changes in the level of a fluid, and which are more generally useful in process control. Temperature difference, likewise, can be measured and indicated in various ways. Apart from operating through the expansion or contraction of some medium due to changes in temperature, a bimetal element can serve in such manner that expansion gives direct mechanical movement, and this movement is well adapted for affecting automatic control. In other systems the temperature difference may cause expansion or contraction in an enclosed fluid which manifests itself as a change in pressure and is accordingly turned into movement by aid of Bourdon tube, helix or bellows. As a still further refinement of interconnecting physical features, temperature difference can be changed to pressure difference—and subsequently movement—by use of a liquid which partly fills an enclosing space so that the resulting vapour pressure serves as the connecting property between the observed temperature and mechanical movement with Bourdon tube or similar device.

In controlling rate of flow, volume changes can be observed by use of volumetric flowmeters which watch the volume of fluid passing and may be arranged to regulate volume passing per unit of time or effect some particular action when a predetermined volume has passed a given point in the plant. A change in density will allow changes in the composition of a solution to be followed and corrected, a hydrometer float of appropriate design being used so that any alteration of immersed level will regulate the amount of the constituent materials passing into solution. Flow control for solids in a continuous process, with regulation of the ultimate composition of a product, is generally possible only by the use of a weighing device, but although continuous weighing is readily accomplished it will be found that many processes, which are continuous as a whole, more often involve batch weighing.

Other Methods of Control

Other methods of controlling plant operations are also in use. Control of the composition of a solution, for instance, can be made on the basis of changes in the electrical resistance of the solution, which frequently bear some definite relationship to the concentration of a particular component and so serve as a guide for feeding that component into the processing system. The development of the photoelectric cell has also opened up new opportunities, as where concentration of some coloured component can be utilised for starting or stopping a feature of the process.

Coming back to this matter of measuring and either indicating, or permanently recording, process variables, it is doubtful if such instruments can be valued too highly, if only for the reason that use avoids possible errors of judgment by men engaged in operating chemical plant. Over-eagerness to adopt measuring instruments, however, must be avoided, as too many indicators and recorders and controllers can easily hamper the operation of plant and so off-set the initial good resulting from the adoption of a few selected instruments. Only by assessing the value of knowing how each variable changes, and its true relationship to the desired course of the process, is it possible to make a wise selection. The variety of instruments which are obtainable is bewildering to a possible user, in the matter of types and patterns with their particular effective ranges of operation and one or many other points put forward in favour of adoption. After limitations imposed by practical range of use, it seems necessary to consider only those refinements which may affect the accuracy of the instrument in that application for which it is suggested to use it. Here, accuracy over a long period of use, with due consideration of the ill effects which may be sustained by strain or by shock—either due to the process

itself or to the particular situation in which the instrument is installed—has to be taken into account.

Every variable which is measured and indicated, or possibly recorded, does not need to be separately controlled. While it may be desirable to show at any particular moment how each variable is changing, it must be remembered that the adjustment of conditions affecting two of the variables will often hold a third variable in check and subsequently turn it and keep it within desired limits. In the production of dry saturated steam, pressure control will automatically provide steam at some definite temperature, but in order to maintain the pressure heat must be added to the boiler plant at the same rate at which heat is drawn away in the form of the steam. The rate at which fuel, air for the combustion of the fuel, and water as source of steam, are supplied must therefore be controlled as distinct from the regulation of pressure. All variables which are considered important for the operation of the plant should be indicated, and recorded if possible. The extent to which either manual or automatic means are adopted for controlling should depend upon relative conditions of being liable to fluctuate, that is, how widely or how rapidly, and whether such fluctuation seriously affects the course of the process. So much depends upon the plant and the process, and upon actual plant operating conditions, that each case should really be considered separately.

Limitations of use and accuracy do not stand alone in pointing to the particular instrument which it will be found favourable to instal. Initial cost and upkeep have also to be considered, and in this it should be kept in mind that the most expensive instrument is not necessarily the most efficient or that it will outlive all cheaper competitors. Hazardous situations, due to external factors, or due to possible sudden fluctuations of temperature, pressure, or other variable, which might be of sufficient magnitude to impose undue strain upon the instrument, quite well warrant the installation of cheaper patterns provided there is no serious difference in accuracy and speed of response. If failure is especially hazardous it may be considered desirable to install instruments in duplicate, and initial cost will then immediately become a matter of concern. Most of the makers endeavour to supply reliable instruments, irrespective of high or low price; the difference in price is sometimes a matter of quicker response to fluctuations, greater resistance to sudden shock, and minor refinements in design which may be important to meet particular circumstances but relatively unessential for general plant needs. It is for such a reason as this that the maker of the instrument should be given all possible information as to what is expected under working conditions and to what extent the conditions of use may be severe or unusually difficult.

The importance of keeping instruments in good working order cannot be over stressed. Testing at regular intervals is necessary if accuracy is to be assured. This is done preferably by the makers under a servicing contract, the frequency of inspection on the plant being left to their discretion. Repairs and adjustments should also be left in the hands of the makers, or their advice should at least be sought, because inaccurate working can easily result from the attentions of an inexperienced person. Maintenance, so far as it is left to the user, should be the concern of one person alone with instrument experience.

Home-Produced Petroleum Substitutes

Report of Inspectors of Explosives for 1938

A HOPE that the revived interest in compressed "town's gas," one of several home-produced substitutes for petroleum, will not be allowed to die is expressed in the sixty-third annual report for 1938 of His Majesty's Inspectors of Explosives, recently issued by the Home Office.

In an introduction and general survey of work the report states that the emergency of September, 1938, caused a stirring in the interest remaining in the gas traction question. Owners of lorries, etc., anticipating the inevitable restriction in petrol supplies, began to think again of possible substitutes, of which compressed "town's gas" is one. A reliable, and at the same time inexpensive design of cylinder would assist a project for the application of "town's gas."

In dealing with accidents in manufacture the report states: The number of accidents during 1938 is about the same as for the previous year, but it is to be regretted that the number of casualties (seven killed and 56 injured) is considerably higher. The increase is due to a serious accident in a mixing house which resulted in the death of six persons and injuries to 29 others. The only other fatal accident was due to the accidental ignition of an incendiary mixture. The serious accident referred to above occurred on January 27 at Nobel's Explosives Co.'s factory at Ardeer, during the mixing by an Atlas mixer of Polar Ammon Gelignite. One of H.M. inspectors held a formal inquiry into the accident and a special report has been issued. The deputy manager of the manufacturing division of the factory was in the building five minutes before the explosion occurred. He left as the 14th batch to be mixed was being prepared; a portion of the ammonium nitrate had been placed in the bowl of the mixer and the men were waiting for the arrival of the remainder of the non-explosive ingredients before adding the thin jelly. Mixing must have commenced very shortly after the deputy-manager left the building, as the chart on the recording time-power instrument was recovered and showed that the mixer had been running for about five minutes.

It also showed that there had been no abnormal strain on the motor, the last curve being normal for Polar Ammon Gelignite. The mixer had been running at half speed and was just ready to be put to full speed. There were 4,421 lb. of explosive in the building, of which 1,200 lb. of practically unmixed explosive were in the mixer. There was no evidence to indicate the cause of the explosion; but, of the various possible causes, the most probable are: (a) A glancing blow struck by a box of explosive against the mixer; and (b) the dropping of some article into the mixer. Of these two causes, the first is regarded as the more likely. Four men in the building were killed; a fifth in the adjoining sieve-house was killed, probably by the collapse of the building, which was constructed of concrete, and a girl who was leaving a nearby cartridging hut was killed by projected debris. Buildings within a radius of 150 yd. of the explosion were damaged, but there was only one other explosion. This occurred in a magazine and was probably due to burning debris falling inside the building after structural damage had been caused by the first explosion. Light debris was projected up to 500 yd., a considerable amount of glass was broken in the factory and there was other damage of a minor nature. Outside the factory several shop windows were broken and a number of ceilings were damaged. The inquiry brought out the following points: (1) The presence of a concrete wall near a building containing a large amount of explosive adds to the danger from projected debris; (2) the replacing in the Atlas mixer of explosive thrown out of the mixer during the initial stages and subsequently swept up is undesirable, as there may possibly be some foreign matter on the floor; (3) the air blast from an explosion causes roofs of lightly constructed buildings in the immediate vicinity to lift, the walls to splay out, and the roof to fall in. Walls should therefore be tied at the top to prevent them from splaying outwards.

Under the heading "Acetylene Accidents," the report

dealt with an explosion and fire on February 19 which entirely destroyed the compressing portion of the British Oxygen Co.'s acetylene station at Jarrow. The report stated: The accident occurred at about 7.45 a.m. Three men were in the compressing room at the time, and were engaged on turning off the valves of charged cylinders. According to their evidence and that of others present in different parts of the works, explosion and flames occurred almost simultaneously in different parts of the compressing room. The compressing room was part of an old building and contained a good deal of wood in its construction, which assisted the fire. The room with over 1,000 cylinders was destroyed, but the compressors, gasometer, generators, carbide store and offices were not seriously damaged.

Although the havoc was so great, evidence was fortunately forthcoming which pointed to what was, in all probability, the cause of the accident. There was no doubt that the original explosion did not occur in a cylinder, as one might be led to suspect, and this possible cause and others need not therefore be discussed. Careful examination of the pipe lines revealed that one of the high-pressure pipes leading into the compressing room was split open, showing that the acetylene under pressure had decomposed and exploded. This pipe had made chance contact with a steel conduit tube carrying an electric light cable, and at the point of contact there was evidence of arcing, due to an elecrical leak from the cable to the conduit pipe across to the high-pressure acetylene pipe line. The local heating of this pipe line would in fact cause a hot spot which would be liable to start decomposition and subsequent explosion of the acetylene under pressure.

Experiments corroborated the almost self-evident theory. With this assumption the spread of the explosion throughout the compressing room and the simultaneous start of fires in all parts were accounted for. The lessons to be learned from this accident are: (1) The need for placing explosion baffles at different points of the high-pressure system in order to prevent a widespread explosion; (2) the need for complete separation of the electrical system from the gas lines.

As regards (1) we witnessed experiments with a multiple disc explosion baffle which worked successfully at pressures considerably higher than the maximum allowable pressure of 225 lb. per sq. in. These baffles are to be installed in all the company's compressing stations.

A review of the behaviour of the acetylene cylinders destroyed by the fire is of interest. Some burst under the action of heat and some appear to have rocketed owing possibly to heat playing on a point, causing loss of ductility, swelling, and finally a local split. The outrushing gas might then propel the cylinder rocket-fashion. A complete cylinder was picked up as far as 175 yards away, while the furthest distance reached by a fragment was 330 yards.

The damaged cylinders were removed by the company and facilities were given for inspection. The cylinders were of various makes. In general their behaviour appears to have been satisfactory in that they had sufficient ductility to remain as a rule either in one piece flattened out, or in a few large pieces. They did not burst and fragment as it were, like a shell. There were, however, exceptions, in that several cylinders showed little ductility, *e.g.*, in one case the neck had been blown off the cylindrical portion without any longitudinal tearing. There did not appear to be any reasons for suggesting either an increase or decrease in the thickness of the cylinders.

It was instructive to note the behaviour of the safety fittings. These consist of thin bursting discs fitted in plugs in the base or in the valves. They are designed to act as safety valves and so to prevent the cylinders from bursting in the event of a slow rise of internal pressure. In general it appeared that the rise of pressure had been so sudden, owing no doubt to the very hot flames of the liberated acetylene, that over-pressure occurred and ripping set in. Examination of some of these cylinders is being undertaken by the National Physical Laboratory on behalf of the Gas Cylinders and Containers Committee of the Department of Scientific and Industrial Research.

Alleged Prussic Acid Poisoning

Judgment Given in Scottish Case

JUDGMENT has been given for the defenders by Sheriff Martin Laing in an action in Kilmarnock Sheriff Court in which cattle poisoning was alleged. (The case was reported in THE CHEMICAL AGE, June 17, p. 447).

The action was at the instance of Thomas Drummond, farmer, Craighead Farm, Mauchline, Ayrshire, who sued Messrs. A. Paterson and Sons, grain and hay merchants, Kilmarnock, for payment of £419 11s. 3d. in respect of alleged loss and damage to calves belonging to him through using feeding stuffs supplied by defenders. In particular, he alleged that an analysis of the linseed cake included in the feeding stuffs showed that it contained substances capable of yielding hydrocyanic acid.

Defenders denied pursuer's averments, and alleged that the pasture in pursuer's field was poor in quality, and contained buttercups and other weeds which were poisonous and injurious to cattle. The hearing of the evidence in the case occupied ten days, and two days were taken up in hearing counsel.

In his interlocutor Sheriff Laing finds it admitted or proved that the linseed cake supplied by defenders to pursuer contained cyanogenetic glucosides capable of yielding 3.85 grains per lb. of hydrocyanic acid; that such a potential content of hydrocyanic acid in linseed cake is not abnormal, and such cake if fed to animals in the recognised way and amount is not injurious to animals. His Lordship also finds that the pursuer has not proved: (1) That the linseed cake supplied by defenders to pursuer had an abnormally potential high rate of yield of hydrocyanic acid; (2) that scouring or persistent scouring is a symptom of prussic acid poisoning; (3) that feeds of one-third lb. of cake with a potential yield of 3.85 grains per lb. of hydrocyanic acid given twice daily to calves in the usual manner and where the other articles of food, such as cooked maize and sheep and lamb cake, as well as vegetation obtained by the animals while grazing, are capable of impairing the functions of the animals so as to result in chronic prussic acid poisoning or chronic and permanent scouring; (4) that the illness from which his cattle suffered was due to the cake supplied by defenders to pursuer for feeding his cattle, or that it was unsuitable as such. The interlocutor further states that the first official sample of cake for analysis was taken on September 14, 1938, and his Lordship finds, in fact and in law, that the delivery of the cake to the pursuer in sacks having stencilled on each the contents of the linseed cake required to be stated by the manufacturers, constituted a delivery in writing of the statutory statement by defenders to pursuer on August 12, and that the first official sample for analysis, not having been taken within 14 days from such delivery, the pursuer has not complied with the requirements of the statute so as to enable him to have the benefit of the statutory warranty that the goods are to be all in respects suitable for feeding to cattle; finds in law (1) that the pursuer, having instructed defenders that when he ordered linseed cake they must supply him with Pearson, Beckitt, and Co.'s linseed cake, that being the trade name under which it is sold, and the defenders having supplied him with such cake are not in breach of the implied warranty in the Sale of Goods Act, 1893; (2) that the pursuer, having failed to prove that the illness from which his cattle suffered was due to the linseed cake supplied by the defenders to the pursuer for feeding his cattle, or to its being unsuitable as such, the defenders are not in breach of the implied warranty in terms of the Fertilisers and Feeding Stuffs Act, 1926 (Section 2).

The Sheriff absolved defenders from the conclusions of the action, and found the pursuer liable to the defenders in the expenses.

PERSONAL NOTES

MR. PETER BENNETT, SIR ANDREW DUNCAN and LORD WEIR, directors of Imperial Chemical Industries, Ltd., are among those who have been appointed members of the Supply Council set up in connection with the establishment of war-time organisation for the supply of munitions. Mr. Bennett is president of the Federation of British Industries and Sir Andrew Duncan is chairman of the executive committee of the British Iron and Steel Federation.

The Supply Council will be constituted as follows:—

Mr. Leslie Burgin, Minister of Supply, chairman; Sir Arthur Robinson, Permanent Secretary to the Ministry, deputy chairman; Mr. Patrick Ashley Cooper, Director-General of Finance; Sir Harold Brown, Director-General of Munitions Production; Lord Weir, Director-General of Explosives; Mr. Peter Bennett, Director of Tanks and Transport (he will also control the production of railway material, engineering and signal stores); Lord Woolton, Director-General of Equipments and Stores; Sir Andrew Duncan, Steel Controller, chairman of the Committee of Controllers (he will represent the whole raw materials organisation); Sir Maurice Taylor, to maintain liaison with the War Office; Col. J. J. Llewellin, to have control of priorities.

Mr. Peter Bennett (above), president of the Federation of British Industries, and Sir Andrew Duncan (right) chairman of the executive committee of the British Iron and Steel Federation, who have been appointed members of the Munitions Supply Council set up last week. Both are directors of Imperial Chemical Industries, Ltd.

* * * *

MR. L. C. HILL, managing director of the County Chemical Co., Ltd., has been confined to his bed through illness. He hopes, however, to be back at his desk by the end of September.

* * * *

THE Ministry of Agriculture and Fisheries has constituted an advisory panel, the members of which will be available for consultation on immediate technical problems which do not call for further research. The members are:—PROFESSOR F. L. ENGLEDOW (subject, cereals and crops), PROFESSOR J. A. HANLEY (soils), PROFESSOR H. D. KAY (dairying), SIR JOHN RUSSELL (plant nutrition), PROFESSOR J. A. SCOTT WATSON (general agriculture), SIR GEORGE STAPLEDON (grassland), DR. T. WALLACE (nutrition of horticultural crops), DR. S. J. WATSON (grass and fodder conservation), DR. H. E. WOODMAN (livestock and nutrition).

Arrangements have been made to ensure that the Agricultural Research Council will work in the closest co-operation with the Ministry of Agriculture and the Department of Agriculture for Scotland in connection with research and investigations into problems arising from the war food production campaign.

* * * *

MR. G. F. ADAMS, B.Sc., has been appointed technical sales representative in the South London area for A. GALLENKAMP AND CO., LTD. Mr. Adams joined the company from the research laboratories of the General Electric Co., Ltd., Wembley, where he had had over 10 years' experience in research and test work, both in the laboratory and on industrial plant.

Mr. G. F. Adams.

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MR. W. H. EDWARDS has now taken over the supervision of the company's apparatus and fittings showrooms at 17-29 Sun Street.

OBITUARY

MR. EDWIN ROBSON, former managing director of British Oil and Cake Mills, Ltd., died on Sunday at the age of 75. As a youth he entered the office of his uncle, Mr. Henry Hodge, seed crusher, who was the first man in Hull to crush cottonseed. Subsequently Mr. Robson acquired the Wilmington Oil Mills and on the formation of the British Oil and Cake Mills, Ltd., his business was taken over by that concern. He was appointed to the directorate, and subsequently became managing director. About nine years ago he retired from the board, and thereafter devoted his business activities to the paint manufacturing firm of Storry, Witty and Company, Ltd.

MR. CHARLES W. PENNELL, chairman of the Lindsey and Kesteven Chemical Co., left estate valued at £59,387 (net personalty, £43,948).

* * * *

MR. G. H. ALCOCK, director of the Waterloo Mills Cake and Warehousing Co., left estate valued at £7,397 (net personalty, £7,265).

Recent Trade Literature

THE INCANDESCENT HEAT CO., LTD., have issued a leaflet describing the incandescent oil fired bogie hearth furnace. This furnace is particularly designed to operate at 600° C. for relieving working stresses in cylindrical steel plate drums up to 50 ft. long by 10 ft. 8 in. diameter and weighing 50 tons. The furnace is equipped with zone control and fan recirculating combustion system.

General News——From Week to Week

WHILE circumstances permit, the hours of opening of the Chemical Society's library will be 10 a.m. to 1 p.m., and 2 p.m. to 5 p.m., with the exception of Saturdays when it will not reopen after 1 p.m.

THE STATUTORY AUTUMN MEETING of the Iron and Steel Institute will be held on Thursday, November 23, 1939, at 3.30 p.m. at the offices of the Institute, 4 Grosvenor Gardens, London, S.W.1. Only formal business will be transacted.

THE PETROLEUM BOARD has been requested by a number of leading candle manufacturers to state that, with the current wholesale price of candles, the public should not be paying more than 6d. per lb. retail.

THE BIRMINGHAM City Analyst (Mr. H. H. Bagnall) in his report for 1938, states that 7,329 samples were submitted for analysis during 1938, and that 368 (or 6.6 per cent.) were found to be adulterated from the 5,591 samples examined under the Sale of Food and Drugs Act.

PHARMACEUTICAL specialities (May & Baker, Ltd.), announce that owing to the great success of "Dagenan" (M. & B. 693) in the treatment of pneumonia, etc., they have been able to increase production, and that, as from October 2 next, a new and reduced resale price will come into force.

THE PROSPECTUS of University courses in the Municipal College of Technology, Manchester, for session 1939-40 has been issued. Comprising 418 pages the volume contains a wealth of detail including summaries of courses, the names of professors and lecturers, conditions of admission, etc.

IN ACCORDANCE with the resolution passed at the extraordinary general meeting of the Institute of Fuel on July 19 last, a petition was presented to His Majesty's Privy Council on August 24, 1939, praying for the grant of a Royal Charter to the Institute. The petition was signed by the president, past-presidents, vice-presidents, honorary officers and elected members of Council.

AS THE RESULT of a conference held in Birmingham last week engineering employees of Imperial Chemical Industries, Ltd., except in its metal group, were granted an increase of bonus on earnings of 3¾ per cent. The conference agreed to increase the bonus on earnings from 6¼ to 10 per cent. as and from October 2 next, and that in lieu of retrospective calculations that a sum of £1 be paid to each of the workers concerned with a proportionate amount to those who entered the service of the company after August 1 last.

THE LONDON section of the Society of Chemical Industry will open the Society's war-time programme on the date previously arranged for the first monthly meeting, Monday, October 2. Owing to the prevailing conditions the event will take the form of a luncheon meeting which will be held at 1 p.m. at the "Victoria," 56 Buckingham Palace Road, Victoria, S.W.1. Dr. G. F. Whitby, director of the Chemical Research Laboratory, Teddington, will address the company on "The Effect on Vegetation of Sulphur Dioxide." The president of the Society, Professsor J. C. Philip, F.R.S., will occupy the chair.

DURING THE course of the preparation of the British Standard No. 659, Light Gauge Copper Tubes, a proposal was submitted by the Copper Development Association that some measure of standardisation in respect of capillary joints, such as are used with this type of tubing, might advantageously be undertaken. The preparation of a specification was accordingly undertaken and a British Standard Specification for capillary joints for copper tubes (internal dimensions of sockets) (B.S. 864) has now been issued. Copies of this specification may be obtained from the British Standards Institution, 28 Victoria Street, London, S.W.1, price 2s. each, or 2s. 2d. post free.

IN THE SERIES of British Standards for marine animal and fish oils a specification has just been published for cod oil for sulphonation purposes (B.S. 868). The specification has been prepared with a view to standardising the quality of cod oil as supplied to the sulphonating industry and gives various requirements and tests including those relating to specific gravity, colour, purity, density, iodine value, saponification value, acidity, etc. It is hoped that this specification will lead to a more uniform quality of oil being supplied to the industry. Copies may be obtained from the British Standards Institution, 28 Victoria Street, S.W.1, price 2s. each, 2s. 2d. post free.

THE UNITED MOLASSES CO., LTD., has donated £525 to the Red Cross and St. John Fund.

BIDS WILL BE INVITED for the works of Palmer & Co., Ltd., glycerine, soap and candle manufacturers, Victoria Works, Stratford, E., when an auction sale is held on the premises on October 5. The sale is being conducted by Rowland, Rawlins, & Co., Great Tower Street, London, E.C.

BUSINESS firms in the U.K. are asked by the War Office to communicate any change of address to M.C.3, War Department, Box No. 600, S.W.D.O., London, S.W.1, so that delay in the despatch and delivery of business correspondence may be avoided.

THE DEPARTMENT OF OVERSEAS TRADE announces that the British Industries Fair, which was to have been held in London and Birmingham in February, 1940, is cancelled. The Department of Overseas Trade will communicate with individual exhibitors in the London Section, and the Birmingham Chamber of Commerce with individual exhibitors in the Birmingham Section.

THE COPPER DEVELOPMENT ASSOCIATION announce that in the present emergency, the Association will for the time being continue its usual activities. The staff has been reduced to some extent by the calling up of certain members for military service, and it may not be possible for all phases of the Association's work to be carried on as fully as hitherto. Nevertheless, every endeavour will be made to give continued service to all interested in the use of copper and copper alloys, to whom the resources of the Association remain available free of charge. Inquiries for information should be sent to the Association at its offices in Thames House, Milbank, London, S.W.1, from which address all its usual publications can still be obtained upon application. Any change of address will be notified in due course.

Foreign News

MANUFACTURERS of electric storage batteries can now import litharge and mixtures containing 50 per cent. by weight of litharge, into Canada, free of duty, from all sources.

ZINC WHITE, lithopone, and other white paints containing zinc, imported into Holland, have had the special supplementary duties continued till February 29, 1940.

AS FROM January 1 next year, all laboratory glassware imported into Canada must bear the name of the country of origin, either by sand-blasting, etching, acid-stamping, moulding, engraving, or burnt-on colour.

THE EXPORTATION from Gibraltar of a number of products including charcoal, kerosene and sulphunamide has been prohibited except under licence issued by the authority of the Governor.

BENZINE, kerosene, nazout (fuel oil), manganese and oleoginous grains and seeds are among the products the export of which from Egypt has been prohibited except under the special authorisation of the Minister of Finance.

THE FOLLOWING are among the products the sxport of which is prohibited from Bulgaria:—hydraulic lime, glycerine, petrol derivatives, extracts of tanning materials, carbide, mineral and vegetable tar, tartaric acid, metals and their alloys, soaps.

THE FOLLOWING have been added to the list of goods, the export of which from the Netherlands is prohibited except under licence:—petrol, kerosene, gas oil, fuel oil, raw mineral oils, and other derivatives, distillates and residues thereof, raw phosphates, calcined soda, caustic soda, crystal soda, bicarbonate of soda, sodium hydrate.

THE EXPORT of the following goods from Italy is prohibited except under licence:—ethyl alcohol, sulphur, raw and refined, mineral oils, turpentine oil, benzole, resinous and tar oils, paraffin wax, ceresine, vegetable tar, gums, resins, soap, oxide of aluminium, methyl alcohol, pulp for the manufacture of paper; mechanical and chemical (cellulose).

ACCORDING to a decree recently promulgated in Belgium the production of a certificate of origin is required for goods imported into Belgium from any country other than Germany, Bulgaria, Spain, Estonia, Greece, Hungary, Italy, Latvia, Rumania and Yugoslavia. The products specified include plastic materials derived from cellulose (celluloid, cellulose acetate, viscose, etc.).

British Overseas Chemical Trade in August

ACCORDING to the Board of Trade returns for the month ended August 31, 1939, imports of chemicals, drugs, dyes and colours were valued at £1,582,389, an increase of £495,853 compared with August, 1938. Exports were valued at £1,924,218, an increase of £248,531. Re-exports were valued at £54,963.

Imports

	Quantities. August 31, 1938.	Quantities. August 31, 1939.	Value. August 31, 1938. £	Value. August 31, 1939.
Acids—				
Acetic .. .. cwt.	7,299	18,663	8,891	23,077
Boric (boracic) .. ,,	3,150	12,960	3,519	13,694
Citric .. .. ,,	1,015	670	4,092	2,737
Tartaric .. .. ,,	1,510	929	6,987	4,308
All other sorts .. value	—	—	6,063	17,061
Borax .. .. cwt.	7,497	33,248	5,642	21,492
Calcium carbide .. ,,	110,051	144,177	50,015	62,216
Fertilisers, manufactured tons	3,107	3,662	16,816	18,339
Potassium compounds—				
Caustic and lyes cwt.	11,479	11,463	13,244	13,050
Chloride (muriate) ,,	378,104	360,444	128,077	125,257
Kainite and other potassium fertiliser salts cwt.	131,852	132,060	25,906	25,016
Nitrate (saltpetre) ,,	6,196	11,146	4,905	9,492
Sulphate .. .. ,,	188,440	135,600	86,564	62,598
All other compounds ,,	7,034	14,347	9,755	15,703
Sodium compounds—				
Chlorate .. .. ,,	837	1,350	907	1,548
Chromate and bichromate .. .. cwt.	1,194	6,884	1,487	10,028
Cyanide .. .. ,,	1,809	2,020	4,728	4,466
Nitrate .. .. ,,	157,306	160,433	36,135	40,200
All other compounds ,,	10,135	22,447	15,511	20,899
Chemical manufactures value	—	—	269,346	464,941
Acids—				
Citric .. .. cwt.	2,267	2,356	10,475	10,689
All other sorts .. value	—	—	21,780	23,007
Aluminium compounds tons	2,493	2,073	21,768	23,424
Ammonium compounds—				
Sulphate .. .. cwt.	22,069	27,871	148,520	188,735
All other sorts .. ,,	1,584	919	20,470	15,076
Bleaching materials—				
Bleaching powder (chloride of lime) .. cwt.	45,000	51,625	11,994	15,420
All other sorts .. ,,	3,642	6,600	9,491	17,276
Coal tar products—				
Cresylic acid .. galls.	106,056	127,015	14,465	12,118
Tar oil, creosote oil ,,	2,319,198	2,114,009	50,736	34,044
All other sorts .. value	—	—	11,801	12,233
Copper, sulphate of tons	722	1,296	12,091	20,567
Disinfectants, insecticides, etc. .. .. cwt.	28,912	42,925	59,814	90,511
Fertilisers, manufactured tons	17,751	13,873	66,904	65,825
Glycerine .. .. cwt.	9,006	8,230	30,014	20,756
Lead compounds ,,	13,088	14,292	17,668	20,511
Magnesium compounds tons	399	491	10,582	12,683
Potassium compounds cwt.	2,551	2,879	9,367	9,808
Salt (sodium chloride) tons	21,219	23,785	53,875	60,166
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	281,945	416,295	93,271	104,350
Caustic .. .. ,,	171,753	195,354	83,240	109,900
Silicate (water glass) ,,	19,708	12,450	6,191	3,903
Sulphate, including salt cake .. .. cwt.	29,989	135,510	4,689	15,774
All other sorts .. ,,	47,845	60,877	72,170	93,266
Chemical manufactures and products .. value	—	—	16,991	40,811
Drugs, medicines and medicinal preparations cwt.	—	—	9,873	11,588
Dyes and dye-stuffs and extracts for dyeing and tanning .. .. cwt.	307	246	4,285	687
Painters' and printers' colours and materials cwt.	651	862	1,081	1,877
Total .. .. value	—	—	32,230	54,963

Exports

	Quantities. August 31, 1938.	Quantities. August 31, 1939.	Imports. August 31, 1938. £	Imports. August 31, 1939.
Drugs, medicines and medicinal preparations—				
Manufactured or prepared—				
Quinine and quinine salts .. .. oz.	152,318	155,439	13,702	13,982
Medicinal oils .. cwt.	3,821	6,805	10,011	20,205
Proprietary medicines value	—	—	64,138	68,384
All other sorts .. ,,	—	—	33,383	50,032
Finished dye-stuffs obtained from coal tar cwt.	3,072	5,332	88,359	174,520
Extracts for dyeing ,,	4,129	1,983	8,295	3,565
Extracts for tanning—				
Chestnut .. ,,	19,983	22,663	14,520	14,806
Quebracho .. ,,	7,009	42,071	5,692	38,571
All other sorts .. ,,	27,903	59,227	23,239	46,126
All other dyes and dye-stuffs .. .. cwt.	493	2,051	10,693	32,261
Painters' and printers' colours and materials—				
White lead (basic carbonate) .. cwt.	6,185	7,421	8,479	9,939
Ochres and earth colours cwt.	22,121	31,944	8,445	11,127
Bronze powders and other metallic pigments .. cwt.	1,585	1,057	11,881	12,501
Carbon blacks .. ,,	30,412	52,446	42,228	69,875
Other pigments and extenders, dry .. cwt.	43,069	47,246	9,899	10,476
Lithopone .. ,,	22,972	23,921	14,079	14,853
All other descriptions ,,	10,647	17,459	20,903	34,444
Total .. .. value	—	—	1,086,536	1,582,389

Exports

	Quantities. August 31, 1938.	Quantities. August 31, 1939.	Value. August 31, 1938. £	Value. August 31, 1939.
Zinc oxide .. .. tons	1,057	1,193	18,718	21,063
All other descriptions value	—	—	197,026	216,272
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts .. .. oz.	130,013	189,216	14,102	21,414
Proprietary medicines value	—	—	101,516	97,447
All other descriptions value	—	—	144,943	147,329
Dyes and dye-stuffs and extracts for dyeing and tanning—				
Finished dye-stuffs obtained from coal tar—				
Alizarine, alizarine red and indigo (synthetic)	123	389	1,113	4,243
Other sorts .. ,,	4,471	6,521	71,056	108,053
Extracts for tanning ,,	23,727	13,887	22,502	13,138
All other descriptions ,,	1,593	1,482	6,184	7,701
Painters' and printers' colours and materials—				
Ochres and earth colours cwt.	10,034	11,102	11,041	10,436
Other descriptions specified in Export List cwt.	6,783	9,042	21,810	28,444
White lead .. ,,	3,566	5,366	7,281	10,094
Ships' bottom compositions .. .. cwt.	3,314	2,216	11,188	7,834
Lithopone .. ,,	11,131	7,741	9,108	5,572
Paints and painters' enamels .. .. cwt.	40,702	38,829	106,683	111,389
Varnish and lacquer (clear) gall.	65,533	62,026	26,466	25,843
Printers' ink .. cwt.	3,993	6,224	18,678	24,045
All other descriptions ,,	39,077	41,308	74,896	83,259
Total .. .. .. value	—	—	1,675,687	1,924,218

Re-Exports

	Quantities. August 31, 1938.	Quantities. August 31, 1939.	Value. August 31, 1938. £	Value. August 31, 1939.
Total .. .. value	—	—	32,230	54,963

Weekly Prices of British Chemical Products

BUSINESS in the general chemical market this week has been very active with dealers in most sections finding it extremely difficult to satisfy the spot demand. The price position of products for which there is an adequate source of supply in the United Kingdom is now assuming a more settled appearance and in a number of instances makers have announced new rates. On the other hand consumers of materials which depend largely on foreign sources of supply such as a number of the potash salts are in many cases unable for the present to obtain sufficient for their immediate needs, and until this situation becomes easier a substantial amount of normal production must remain curtailed. A good trade has been put through in coal tar products and prices generally are harder. Quotations for cresylic acid and carbolic acid crystals are above recent levels with supplies of the latter product scarce.

MANCHESTER.—Nominal price conditions continue to rule in a good many sections of the Manchester chemical market, and until the position in this respect is very much clearer than it is to-day sellers are unlikely to depart from their policy of reserve so far as fresh transactions are concerned. In the meantime the call for supplies from pretty well all consuming industries in this part of the country against old contracts is on steady lines. In the tar products market during the past week there has been a good demand for most of the light distillates, which are on a firm price basis, and where movements have occurred since last report they have been in an upward direction.

GLASGOW.—There is a continued large demand for chemicals in the Scottish heavy chemical market. Delays in deliveries are principally due to lack of road transport. Prices have generally advanced.

Price Changes

Rises: Ammonium Chloride, Carbolic Acid, Copper Sulphate, Sodium Sulphate (Salt Cake), Xylol.

General Chemicals

ACETONE.—£39 to £43 per ton, according to quantity.

ACETIC ACID.—Tech., 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech., glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE (see Salammoniac).—Firsts, lump, spot, £42 17s. 6d. per ton; d/d address in barrels. Dog-tooth crystals, £40 per ton; fine white crystals, £20 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

AMMONIUM DICHROMATE.—9½d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £10 10s. per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £15 10s. per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contract. GLASGOW: £9 5s. per ton net ex store.

BORAX COMMERCIAL.—Granulated, £18 per ton; crystal, £19; powdered, £19 10s.; extra finely powdered, £20 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £18 per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £32 per ton; crystal, £33; powdered, £34; extra finely powdered, £36, in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £33; powdered, £34, 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 15s. per ton f.o.r. London.

CALCIUM CHLORIDE.—GLASGOW: 70/75% solid, £5 12s. 6d. per ton ex store.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4⅝d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 3d. per lb.; liquor, £13 per ton d/d station in drums.

CHROMIC ACID.—10d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11¾d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0½d. per lb. MANCHESTER: 1s. 0½d. GLASGOW: B.P. crystals, 1s. 0½d. per lb; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in bags. MANCHESTER: £23 per ton f.o.b. GLASGOW: £19 10s. per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, £4 12s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1,260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 7s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. MANCHESTER: White, £38. GLASGOW: White crystals, £30; brown, £1 per ton less.

LEAD NITRATE.—£27 per ton for 1-ton lots.

LEAD, RED.—£34 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. GLASGOW: £31 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—GLASGOW: Ground, £31 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. GLASGOW: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY PRODUCTS.—Ammoniated B.P. (white precip.), lump, 6s. 5d. per lb.; powder B.P., 6s. 7d.; bichloride B.P. (corros. sub.), 5s. 8d.; powder B.P., 5s. 1d.; chloride B.P. (calomel), 6s. 2d.; red oxide cryst. (red precip.), 7s. 6d.; levig, 6s. 9d.; yellow oxide B.P. 6s. 10d.; persulphate white B.P.C., 6s. 7d.; sulphide black (hyd. sulph. cum. sulph. 50%), 6s. 6d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. MANCHESTER: £49 to £55 per ton ex store. GLASGOW: £2 9s. per cwt. in casks.

PARAFFIN WAX.—GLASGOW: 3¾d. per lb.

POTASH, CAUSTIC.—Solid, £33 5s. to £38 per ton according to quantity, ex store; broken, £40 per ton. MANCHESTER: £47.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. MANCHESTER: £37 per ton. GLASGOW: 4½d. per lb.

POTASSIUM DICHROMATE.—5½d. per lb. carriage paid. GLASGOW: 5½d. per lb., net, carriage paid.

POTASSIUM CHROMATE.—9d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P. 7s. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity.

POTASSIUM PERMANGANATE.—LONDON: 9¼d to 10½d. per lb. MANCHESTER: B.P. 9½d. to 11½d. GLASGOW: B.P. Crystals, 10½d.

POTASSIUM PRUSSIATE.—9½d. to 10½d. per lb. MANCHESTER: Yellow, 6¾d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store.

SALT CAKE.—Unground, spot, £3 8s. 6d. per ton.

SODA ASH.—Light 98/100%, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 10s. per ton d/d station.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags in 1-ton lots. MANCHESTER: £10 15s. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags.

SODIUM BISULPHITE POWDER.—60/62%, £12 10s. to £14 per ton d/d in 2-ton lots for home trade.

SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.

SODIUM DICHROMATE.—Crystals cake and powder 4¼d. per lb. net d/d U.K. with rebates for contracts. GLASGOW: 4½d. per lb., carriage paid.

SODIUM CHROMATE.—5d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—Pea crystals, £15 15s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.

SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £8 5s. per ton for 6-ton lots d/d. GLASGOW: £1 12s. per cwt. in 1-cwt. kegs, net, ex store.

SODIUM NITRITE.—£18 5s. per ton for ton lots.

SODIUM PERBORATE.—10%, £4 per cwt. d/d in 1-cwt. drums.

SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.

SODIUM PRUSSIATE.—4d. per lb. for ton lots. MANCHESTER: 4¼d. to 5d. GLASGOW: 4d.

SODIUM SILICATE.—£8 2s. 6d. per ton.

SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. MANCHESTER: £3 15s.

SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.

SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

TARTARIC ACID.— 1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¾d. per lb. GLASGOW: 1s. 1¼d. per lb., 5%, ex store.

ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2-cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7¾d. to 1s. 3d. per lb., according to quality. Crimson, 1s. 7½d. to 1s. 8½d. per lb.

ARSENIC SULPHIDE.—Yellow, 1s. 6d. to 1s. 8d. per lb.

CARBON DISULPHIDE.—£33 to £36 per ton, according to quantity, drums extra.

CARBON TETRACHLORIDE.—£44 to £49 per ton, according to quantity, drums extra.

CHROMIUM OXIDE.—Green, 1s. 3d. per lb.

INDIA-RUBBER SUBSTITUTES.—White, 4½d. to 5d. per lb.; dark 3¾d. to 4¾d. per lb.

SULPHUR CHLORIDE.—6d. to 8d. per lb., according to quantity.

VEGETABLE BLACK.—£35 per ton upwards; 28/30%, £15 10s. 0d.; 60%, £29, delivered buyers' premises.

ZINC SULPHIDE.—£56 per ton ex works.

Plus 5% War Charge.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1940; September, £7 5s.; October, £7 6s. 6d.; November, £7 8s.; December, £7 9s. 6d.; January, 1940; £7 11s., February £7 12s. 6d.; March/June, £7 14s.

CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1940; September £8 2s. 6d.; October £8 3s. 9d.; November £8 5s.; December, £8 6s. 3d.; January, 1940, £8 7s. 6d.; February £8 8s. 9d.; March £8 10s.; April/June, £8 11s. 3d.

NITRO-CHALK.—£7 10s. 6d. per ton up to June 30, 1940.

SODIUM NITRATE.—£8 5s. per ton for delivery up to June 30, 1940.

CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9. MANCHESTER: Crude, 1s. 0¼d. to 1s. 0¾d. per gal.; pure, 1s. 8d. to 1s. 8½d. per gal.; motor grade 1s. 6½d.

CARBOLIC ACID.—Crystals, 9d. per lb.; Crude, 60's, 1s. 7d. to 1s. 10d.; dehydrated, 1s. 9d. to 2s. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.

CREOSOTE.—Home trade, 3¾d. to 4d. per gal., f.o.r., makers' works; exports 6d. to 6¼d. per gal., according to grade. MANCHESTER: 3¾d. to 5d.

CRESYLIC ACID.—97/99%, 2s. 8d. to 2s. 10d.; 99/100%, 2s. 6d. to 2s. 9d. per gal., according to specification. MANCHESTER: Pale, 99/100%, 2s.

NAPHTHA.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1¼d. to 1s. 3d. per gal., naked at works, according to quantity. MANCHESTER: 90/160%, 1s. 6d. to 1s. 7¼d. per gal.

NAPTHALENE.—Crude, whizzed or hot pressed, £6 to £6 10s. per ton; purified crystals, £9 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £4 10s. per ton. MANCHESTER: Refined, £11 to £12.

PITCH.—Medium, soft, 26s. per ton, f.o.b. MANCHESTER: 27s. 6d. f.o.b., East Coast.

PYRIDINE.—90/140%, 17s. 6d. per gal.; 90/160%, 15s.; 90/180%, 3s. to 4s. per gal. f.o.b. MANCHESTER: 13s. to 17s. per gallon.

TOLUOL.—90%, 2s. 1d. to 2s. 2d. per gal.; pure 2s. 6d. to 2s. 7d. MANCHESTER: Pure, 2s. 7d. per gallon, naked.

XYLOL.—Commercial, 2s. 3d. per gal.; pure, 2s. 5d. MANCHESTER: 2s. 6d. per gallon.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £6 15s. to £9 5s. per ton; grey, £8 to £8 5s. MANCHESTER: Grey, £14.

METHYL ACETONE.—40.50%, £32 to £35 per ton.

WOOD CREOSOTE.—Unrefined, 6d. to 8d. per gal., according to boiling range.

WOOD NAPHTHA, MISCIBLE.— 2s. 8d. to 3s. per gal;. solvent, 3s. to 3s. 5d. per gal.

WOOD TAR.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—1s. 10d. per lb., for cwt. lots, net packages.

BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.

BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11d. per lb. d/d buyer's works.

m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.

p-CRESOL 34/35° C.— 1s. 7d. to 1s. 8d. per lb. in ton lots.

DICHLORANILINE.—2s. 1½d. to 2s 5½d. per lb.

DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.

DINITROBENZENE.—7½d. per lb.

DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.

DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 11d.

DIPHENYLAMINE.—Spot, 2s. 3d. per lb.; d/d buyer's works.

GAMMA ACID, Spot, 4s. 4½d. per lb. 100%, d/d buyer's works.

H ACID.—Spot, 2s. 7d. per lb.; 100%, d/d buyer's works.

NAPHTHIONIC ACID.—1s. 10d. per lb.

β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.

α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.

β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.

NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.

o-NITRANILINE.—4s. 3½d. per lb.

m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 10d. to 1s. 11d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.

NITRONAPHTHALENE.—9½d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

SULPHANILIC ACID.—Spot, 8¾d. per lb. 100%, d/d buyer's works.

o-TOLUIDINE.—10½d. per lb., in 8/10 cwt. drums, drums extra.

p-TOLUIDINE.—1s. 10½d. per lb., in casks.

m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Latest Oil Prices

LONDON.—Sept. 27.—Arrangements for control are not yet completed, and, apart from non-controlled commodities, trading was very restricted.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ELLAND DYEING CO., LTD. (M., 30/9/39.) Sept. 18, mortgage to Midland Bank, Ltd., securing all moneys due or to become due to the bank; charged on lands, hereditaments and premises, etc., at Saddleworth Road, Elland. *£2,117. Dec. 31, 1938.

TELLAM PRODUCTS, LTD., Newton Abbot, manufacturers of meals, oil cakes, etc. (M., 30/9/39.) Sept. 18, mortgage to Midland Bank, Ltd., securing all moneys due or to become due to the Bank, charged on properties at Newton Abbot, Hatherleigh, Payhembury, Cheriton Bishop and Exeter.

Company Winding Up Voluntarily

THE NEW MILL GAS LIGHT COMPANY, LIMITED. (G.W.U.V., 30/9/39.) Mr. William Gordon Sharpe of Market Place Chambers, Huddersfield, chartered accountant, appointed liquidator.

Release of Liquidator

VENEZUELAN CONSOLIDATED OILFIELDS, LIMITED, Finsbury Pavement House, Moorgate, London. (R.O.L., 30/9/39.) Liquidator: Hugh Parker Naunton, Official Receiver and liquidator, 33 Carey Street, Lincoln's Inn, London, W.C.2. Sept. 8, 1939.

Satisfactions

JAMES WHITWORTH AND SONS, LTD., Leeds, oil extractors, etc. (M.S., 30/9/39.) Satisfaction Sept. 18 of mortgage registered September 8, 1934.

MAXTON PRODUCTS, LTD., St. Helens, soap manufacturers. (M.S., 30/9/39.) Satisfaction September 19, of debenture registered April 6, 1937.

WALTER CARSON AND SONS, LTD., London, S.W., paint manufacturers, etc. (M.S., 30/9/39.) Satisfaction Sept. 20, £4,500, registered July 10, 1936.

County Court Judgment

F. BEAVIS, LTD., R/O. 175 Hoxton Street, N.1, oil and colourmen. (C.C., 30/9/39.) £54 13s. 6d. August 21.

New Companies Registered

Lumax (Great Britain), Ltd.—356,566. Private company. Capital, £1,000 in 1,000 shares of £1 each. To carry on the business of manufacturers of and dealers in luminous and luminescent paints and powders, fluorescent paints, pigments and dyes. Directors: Sir Hector M. Macneal, Trafalgar House, Waterloo Place, S.W.; Fredk. Cumber, Eric R. McNab. Solicitors: Joynson-Hicks & Co., Lennox House, Norfolk Street, W.C.2.

O. S. Daniel & Co., Ltd.—356,591. Private company. Capital, £4,000 in 4,000 ordinary shares of £1 each. To carry on the business of manufacturing chemists, chemical merchants and general traders (wholesale and retail) in and importers of essential oils, synthetic perfumes, essences, compounds, etc. Directors: Samuel O. Daniel, 18 Lancaster Terrace, London, W.2; and Walter Barraclough. Registered office: 101 Swan Arcade, Bradford.

Anti-Glare Shades, Ltd. 356,651.—Private company. Capital, £1,000 in 1,000 ordinary shares of £1 each. To carry on the business of manufacturers and distributors of and dealers in electric, gas, oil and other lamps shades. Power is taken to manufacture fire fighting apparatus, motor vehicles, chemicals, extinguishers and river floats, etc. Directors are: Edward V. Waller, 20 West Hill Road, Wandsworth, S.W.18; William E. Ashton. Registered office: 9 North Street, Leatherhead, Surrey.

Percy Leach, Ltd. (356,503).—Private company. Capital: £500 in 500 shares of £1 each. Objects: To carry on the business of manufacturers of and dealers in fireproofing mixtures, solutions and paints, and fire extinguishers, manufacturing chemists and druggists, etc. Directors: Percy Leach, 73 Dalyell Road, Brixton, S.W.9; William Hart; William E. Watson. Solicitors: Davies & Graham, 222 Strand, W.C.2. Registered office: Gloucester House, 19 Charing Cross Road, W.C.2.

B.B. Technical Laboratories, Ltd. (356,684).—Private company. Capital £250 in 250 shares of £1 each. To carry on the business of manufacturers of and dealers in chemicals and chemical substances, minerals, fluorescent or luminescent materials, paint and substances allied thereto, woods, engineering and turnery or joinery products, glass, metals and metallic substances, etc. Subscribers: Beryl Roberts, 146 Engadine Street, Southfields, S.W.18; Joan Micklam. First directors to be appointed by the subscribers. Solicitors: Morley, Marshall & Co., 4 Tilney Street, Park Lane, W.1.

Cheshire Gum Company, Ltd.—356,609. Private company. Capital, £5,000 in 5,000 shares of £1 each. To acquire the business of gum manufacturers carried on at Carrington Field Street, Stockport, as the "Cheshire Gum Company," and to adopt an agreement with the Sizing Materials Company, Ltd., and to carry on the business of chemical manufacturers, etc. Directors: William Collison, 8 Rowsley Road, St. Annes-on-Sea; William H. Blythe. Solicitor: Albert Davies, 89 Fountain Street, Manchester. Registered office: 321 Royal Exchange, Manchester.

Solva Products, Ltd. (356,604).—Private company. Capital: £1,500 in 1,500 shares of £1 each. To carry on the business of manufacturers of and dealers in "Soiva" products or any other processes for the treatment of water and other fluids for the prevention or cleansing of corrosive matter in pipes, drains and water apparatus, etc. Directors: Gerald B. Lloyd, 32 Meadow Hill Road, Kings Norton, Birmingham; Charles G. L. Scott; Fred Esling. Solicitors: Kimbers Williams & Co., 34 Nicholas Lane, E.C.4. Registered office: 31 Lombard Street, E.C.3.

Chemical and Allied Stocks and Shares

EARLIER in the week business in the industrial and other sections of the Stock Exchange was reduced to a minimum owing to the widespread tendency to await the Emergency Budget statement. Subsequently, markets had a steadier appearance, although sentiment was influenced by uncertainty as to the course to be adopted by Russia in regard to international affairs, and in the absence of demand, movements in share values were to lower levels.

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Despite satisfaction with the maintenance of the interim dividend at 3 per cent., Imperial Chemical were slightly lower on balance at 25s. 3d., but Borax Consolidated Deferred at 23s. 9d. and Imperial Smelting at 10s. 6d. were relatively steady features. Associated Cement at 63s. 1½d. had a firmer appearance, but Fison Packard were lower at 37s. and British Match were marked down from 34s. to 30s. 7½d. Distillers fluctuated, but at 84s. 6d. were better on balance for the week. B. Laporte were inactive, but continued to have a "middle" quotation of 57s. 6d.

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Sentiment in regard to United Molasses continued to be influenced by the hope that earnings from the company's tankers may do much to offset lower income from other sections of the business, and on balance the shares were only slightly lower at 24s. 9d. Pinchin Johnson were marked down to 16s. 3d., but International Paint remained around 75s. and Indestructible Paint kept at 76s. 3d., aided by the maintenance of the interim dividend. Wall Paper Manufacturers' Deferred units were again quoted at 20s. and Goodlass Wall at around 9s. In sympathy with the surrounding market trend, the majority of movements in iron and steel securities were reactionary, but as in most other sections of the Stock Exchange, no heavy selling was reported, and the reduced prices were attributed mainly to the absence of demand. Subsequently, however, Dorman Long had a steadier appearance at 22s. 6d., and similar remarks apply to Guest Keen at 22s. and to Staveley at 37s. 6d. General Refractories were maintained around 7s. 6d., but were inactive this week.

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Turner and Newall, Dorman Long, British Oxygen and other widely-held shares moved very closely with the general market trend, while Boots Drug were marked down to 36s. 3d. Beechams Pills Deferred were 5s. 9d., and Timothy Whites and Taylors 21s., having reflected the downward tendency in most shares of companies which are dependent on the spending power of the public. It is, however, generally expected there will be good recovery in the latter before long in view of the further big growth in armament and other Government work. Barry and Staines were better at 29s. and British Drug Houses were again quoted at 21s. 3d., but were apparently not testd by business this week. British Glues improved slightly to around 4s. 9d., but British Oil and Cake Mills preferred ordinary were reduced to to 33s. 9d., and United Premier Oil and Cake to 6s. 10½d., while Tarmac had a "middle" price of 26s. 3d. Courtaulds at 25s. 9d., and British Celanese at 4s. 7½d. have failed to move against general market conditions.

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Attention drawn in the market to the upward movement in the earnings of oil companies during the period of the great war assisted oil shares earlier in the week, but prices reacted later. Trinidad Leaseholds, however, were higher on balance at 93s. 9d.